3 FEBRUARY 1955 ONE SHILLING

ELECTRICAL TIMES

COPPER BUSBARS by BICC

BICC design, manufacture, and install complete busbar systems, including all conductors and supports. Illustrated above is part of the system supplied for the electro-tinning plant at the Ebbw Vale Works of Messrs. Richard Thomas & Baldwins Ltd. The total current carried approaches 50,000 amperes. The resources of BICC and its associated company, British Copper Refiners Ltd., for refining, rolling and extruding copper, are specially suited to the production of heavy current busbars.

Publication 304 *tells you more about BICC busbars. Further technical advice is readily available from our specialist engineers.*

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 BLOOMSBURY ST., LONDON, W.C.1

Quicker HEATING...

Quicker

THE *NEW*

B·N·E **C.90**

ELECTRIC COOKER

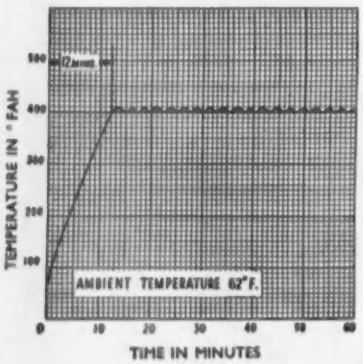
WITH THE AMAZING

SPEEDHEAT OVEN!

The outstanding performance of the "Speedheat" Oven in the B.N.E. C.90 Electric Cooker—the newcomer to the B.N.E. range—will make an instant appeal to the discerning housewife.

Here is a big "easy-to-clean" oven with a new element design which, when coupled with the highly reflective pearl grey vitreous enamel and scientifically controlled air circulation, provides remarkably quick heating with superb cooking qualities.

The pre-heating time is only half that of many standard cookers. Every housewife will realise that this spells greater convenience and considerable saving of time and current.



The graph alongside shows that a temperature of 400°F is reached from an ambient temperature of 62° in **only 12 minutes.**

Yes, this new "Luxury" C.90 will be a quick seller—particularly when the purchaser knows that an exclusive Pyrex heat-resisting glass casserole/grill pan, a heated drawer, and an 8" radiant plate with simmer control are all included for the moderate price of £48.

BRITISH NATIONAL ELECTRICS LTD.

The Domestic Appliance Section of JOHNSON & PHILLIPS LTD.

NEWARTHILL MOTHERWELL SCOTLAND

Model

UNIVERSAL AVOMETER

20,000 ohms per volt *plus* AUTOMATIC Overload Protection

Produced in response to a demand for a high sensitivity version of the world-famous Universal AvoMeter, this model incorporates the traditional design features of its predecessors, so highly valued for simplicity of operation and compact portability.

It has a sensitivity of 20,000 ohms per volt on all D.C. voltage ranges and 1,000 ohms per volt on A.C. ranges from 100 V upwards. A decibel scale is provided for audio frequency tests. In addition, a press button has been incorporated which reverses the direction of current through the moving coil, and thus obviates the inconvenience of changing over test leads when the current direction reverses. It also simplifies the testing of potentials, both positive and negative, about a common reference point. A wide range of resistance measurements can be made using internal batteries, separate zero adjustment being provided for each range.

It is of importance to note that this model incorporates the "AVO" automatic cut-out for protection against inadvertent overloads.

Size 8¼" x 7¼" x 4½"
Weight 6½lbs. (including leads)

£23 : 10s.

For your Valve Characteristic Meter or Valve Tester

Owing to the very large number of valves which have been issued within the last two years, no further amendments will be issued for the original "AVO" Valve Testing Manual. A new, completely revised and fully up-to-date Valve Data Manual is now available from the Company at 15/- post free.

D.C. VOLTAGE	D.C. CURRENT	A.C. VOLTAGE	A.C. CURRENT	RESISTANCE
2·5V.	50μA.	2·5V.	100mA.	First indication 0·5Ω.
10V.	250μA.	10V.	1A.	Maximum indication 20MΩ.
25V.	1mA.	25V.	2·5A.	0—2,000Ω — using internal batteries.
100V.	10mA.	100V.	10A.	0—200,000Ω — using internal batteries.
250V.	100mA.	250V	—	0—20Ω — using external batteries.
1,000V.	1A.	1,000V.	—	
2,500V.	10A.	2,500V.	—	0—20MΩ — using external batteries.

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE · DOUGLAS STREET · LONDON S.W.1 *Telephone* VICtoria 3404—9

A

"LET'S CALL IN THE LIVELY LADS AT LORIVAL!"

Plastic jobs are best left to Lorival, as many leading manufacturers have found to their advantage. They're lively lads at Lorival. And they've got what it takes to produce mouldings of high quality in large quantities at low prices.

Consider the following facts ... then - call in Lorival's lively lads!

Production—Lorival have one of the largest and most modern moulding shops in the country.

Tools—Mouldings can't be better than the tools that produce them. Lorival employ many of the finest designers and toolmakers in the business.

Costs—Constant output—Lorival work a three-shifts production of 100 hours a week—lowers costs, speeds delivery.

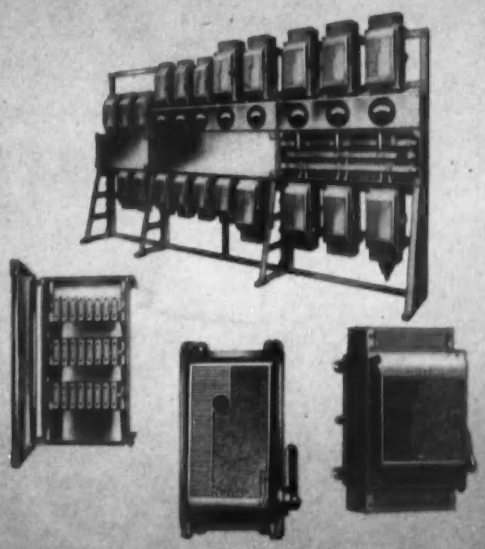
How It's Done—Lorival don't just mould plastics to customers' requirements. They really get their teeth into the problem. Work out ways and means of simplifying production and saving you money. An interesting Lorival booklet—'How It's Done'—follows a plastic moulding job through from start to finish. Lorival will be pleased to send you a copy on request.

LS8

LORIVAL PLASTICS

UNITED EBONITE & LORIVAL LTD., LITTLE LEVER, NR. BOLTON, LANCS.

You cannot buy better gear



THE COMPLETE INSTALLATION

by

STAND Nº 143
A.S.E.E. EXHIBITION
EARLS COURT 15TH - 19TH MARCH 1955

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
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High up in his eyrie, the crane driver surveys the industrial scene . . . a scene which, in its variety, typifies the activities of the Thos. W. Ward organisation. Steelwork supplied and erected by Wards . . . plant and machinery supplied and installed by Wards . . . roads and sidings laid by Wards with materials produced by Wards . . . even the crane he drives is built by one of the Ward Group of Companies. Indeed, there can be few branches of industry to which the Ward Group cannot make some vital contribution. With such a wealth and diversity of experience behind it, is it to be wondered at that the name of Ward has become a byword in industrial circles throughout the world?

THE TWW SERVICE INCLUDES:–

Iron & Steel · Non Ferrous Metals · Plant & Machinery · Foundry Plant & Supplies · Tractors & Earth Moving Plant Contractors' Plant & Equipment · Shipbreaking · Structural Steelwork · Excavators and Cranes · Industrial Plant · Rails & Sidings · Granite & Freestone · Roadstone & Roadmaking · Cement · Industrial Dismantling · Wire & Wire Products Nuts & Bolts · Packings & Jointings · Insulating Materials · Food Preparing Machinery · Factory Planning & Installation

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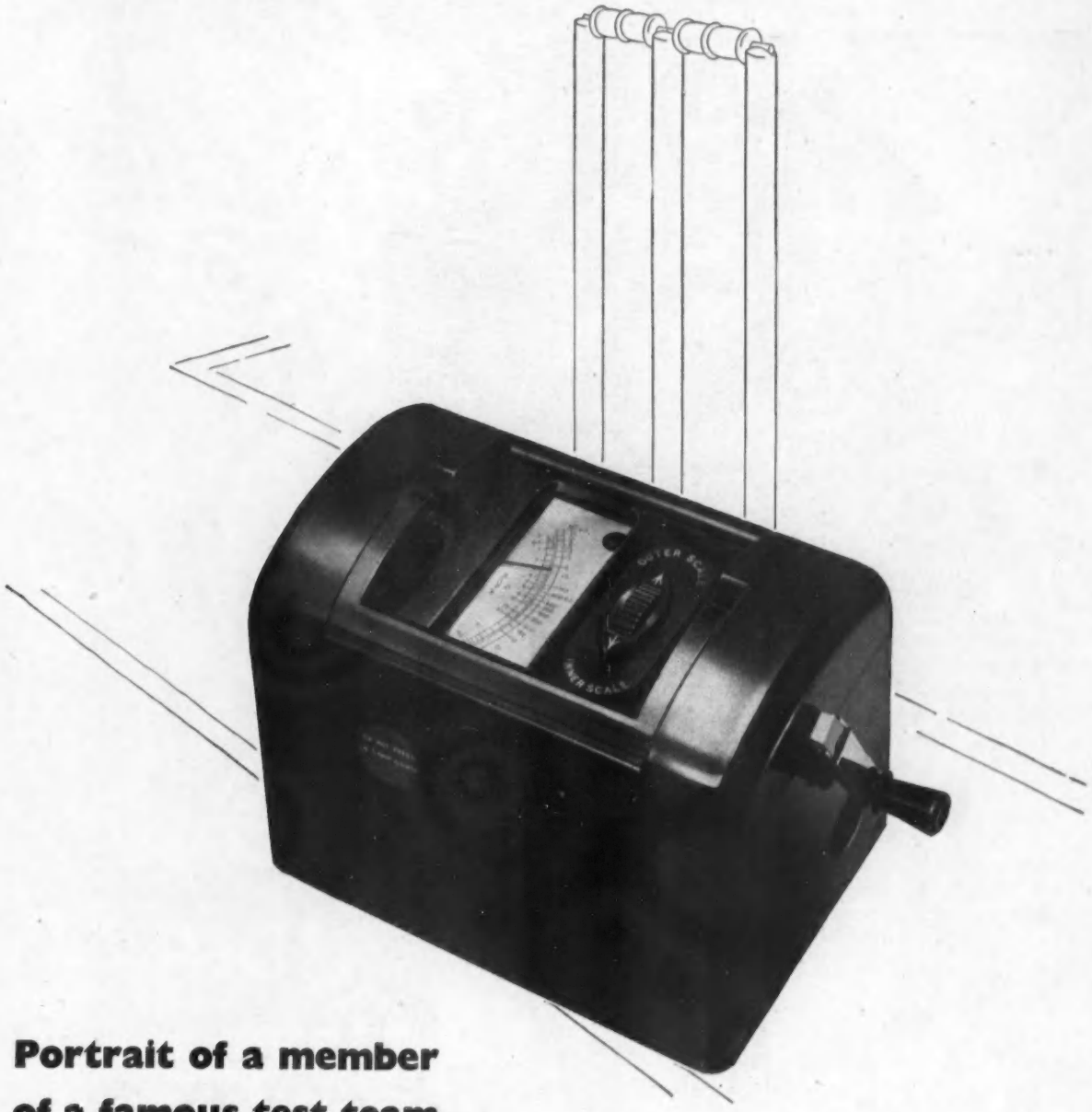

Portrait of a member of a famous test team

Why be caught out by faulty insulation or stumped by that insulation problem. By using a "Megger" Insulation Tester you can ensure that your equipment will have a good innings.

The Series 4 instrument, illustrated above, is the latest addition to the "Megger" range of insulation testers. Ideal for testing house wiring, portable tools, small motors and domestic apparatus. Insulation range 50 megohms at 500 volts — Constant pressure generator — Can be supplied with additional ohm scale for continuity tests.

Please write for illustrated leaflet J051/5

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THE SWISS ARE EXPERTS AT WATCH MAKING

Who can doubt it? Even so, the finest timepiece may occasionally be in need of repair. Similarly, faults can develop in the best conceived system of electrical wiring. And much inconvenience it causes when cabling is housed in barrel conduit of the ordinary type. CHANNEL CONDUIT, on the other hand, makes the overhaul of faulty circuits a routine task—for the patented capping *springs* off without difficulty, allowing quick access to the wiring layout. Rust-resisting and vibration-proof, CHANNEL CONDUIT costs less to buy, install and maintain than any other form of trunking. It is extensively used by Industry and Government Departments. Sizes stocked range from 4″ × 4″ to 1″ × ½″, and full details may be had by requesting a copy of pamphlet No. R.A.31.

THE CHOICE OF THE EXPERTS

CHANNEL CONDUITS LTD.,
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of course!

The Range of Electric Water Heaters, large and small, to meet every need. Each unit is built to a proud standard of perfection arrived at by more than 30 years of specialisation in electric water heating problems.

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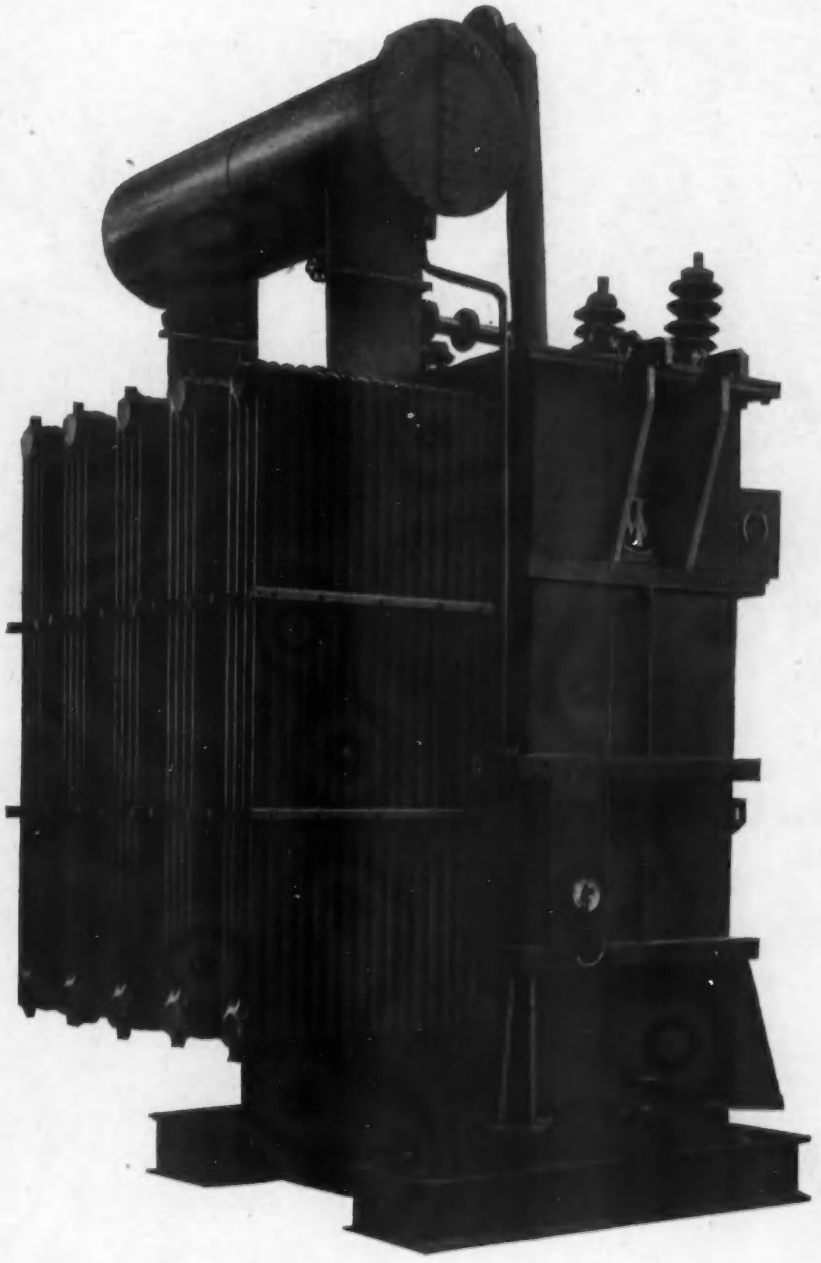
IN
ALL TYPES
OF
TRANSFORMERS
UP TO
35,000 kVA



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TRANSFORMERS (WATFORD) LIMITED

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STANDARD PROTECTED WITH FEET

ALTERNATIVE TYPES
TOTALLY ENCLOSED
WITHOUT FEET
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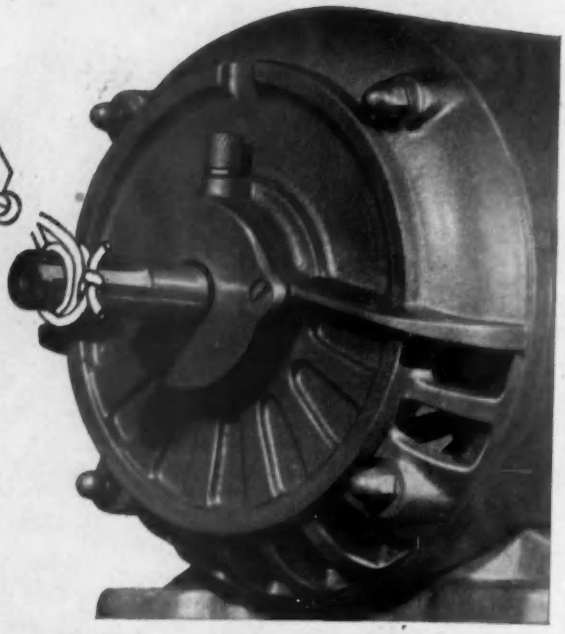
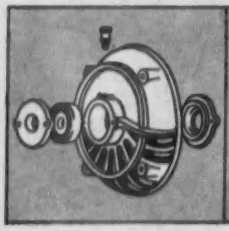
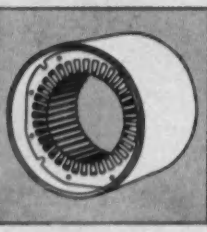
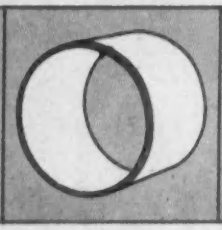
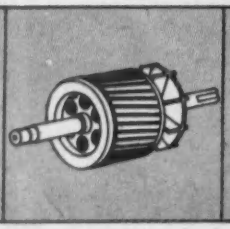
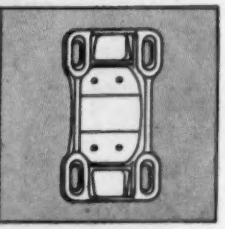


BROOK GRYPHON
FRACTIONAL HORSE POWER MOTORS

ATTRACTIVE FINISH

BALL OR SLEEVE BEARINGS AT THE SAME PRICE

BEARINGS	STAMPINGS	STEEL SHELL	ROTOR	FEET
				
Super silent ball bearings fitted as standard.	Pressure assembled pack ensures a rigid stator winding.	3/16" rolled steel shell makes a stout outer frame.	Pressure cast aluminium rotor, dynamically balanced to give vibration free running.	Accurately machined cast iron feet. Firmly fixed but easily detachable.

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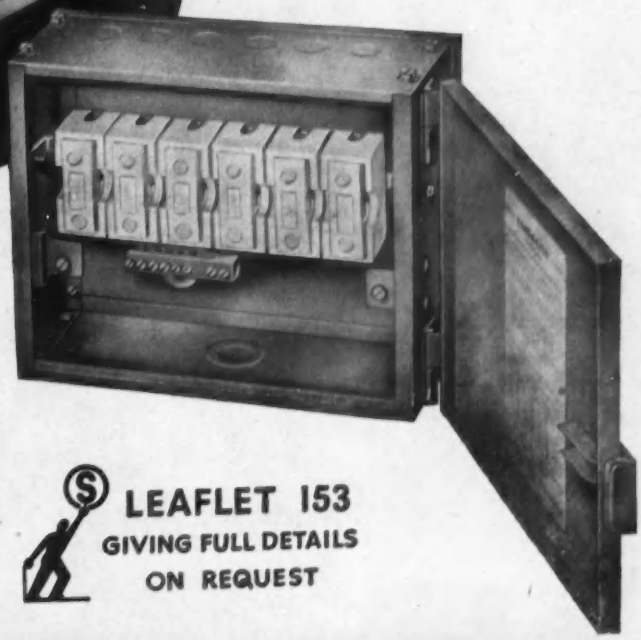
EARLS COURT ELECTRICAL ENGINEERS EXHIBITION LIMITED A.S.E.E. MARCH 15TH TO 19TH 1955

"SANDALITA"

250 VOLT SP & N FUSEBOARDS

. . . very inexpensively incorporating one of our long established and well tried fuses in a modern, light, sheet steel case.



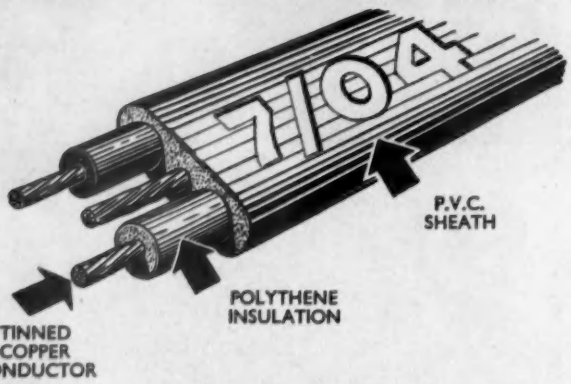
A further item in the development programme of

SANDERS
WEDNESBURY

LEAFLET 153
GIVING FULL DETAILS ON REQUEST

WM. SANDERS & CO. (WEDNESBURY) LTD., WEDNESBURY, STAFFS.

ASHATHENE CUTS COSTS!



SAVE ON MATERIAL

ASHATHENE is a tough yet flexible cable with tinned copper conductors insulated with polythene. The cores are colour coded in accordance with B.S.S. and I.E.E. requirements to provide ready identification. Thanks to the p.v.c. sheathing, the cable may be embedded in plaster or cement without any deterioration occurring.
Armoured ASHATHENE cables are also available for power wiring and provide that extra mechanical protection usually required in factory installations.

SAVE ON LABOUR

ASHATHENE is already established as cable which enables a safe and permanent electrical installation to be made in less time and at lower expenditure.
Time spent on conduit bending and screwing may be eliminated since ASHATHENE readily cleats into position along girders, walls, etc. ASHATHENE is easily manipulated and strips cleanly and quickly. You are invited to send for leaflets and technical data which deal with electrical and mechanical characteristics and notes on wiring methods. ASHATHENE is manufactured to B.S.S. 1557 in the types where this specification is applicable.

ASHATHENE IS COMPETITIVELY PRICED THROUGHOUT THE WIDE RANGE OF ARMOURED AND NON-ARMOURED TYPES.

AERIALITE LIMITED

CASTLE WORKS, STALYBRIDGE, CHESHIRE. Depots at: London, Bristol, Birmingham, Manchester, Newcastle, Glasgow.

This is an advertisement of the Aerialite Ltd. group of companies. C.106 J.Y.

GENRISTO

LTD.

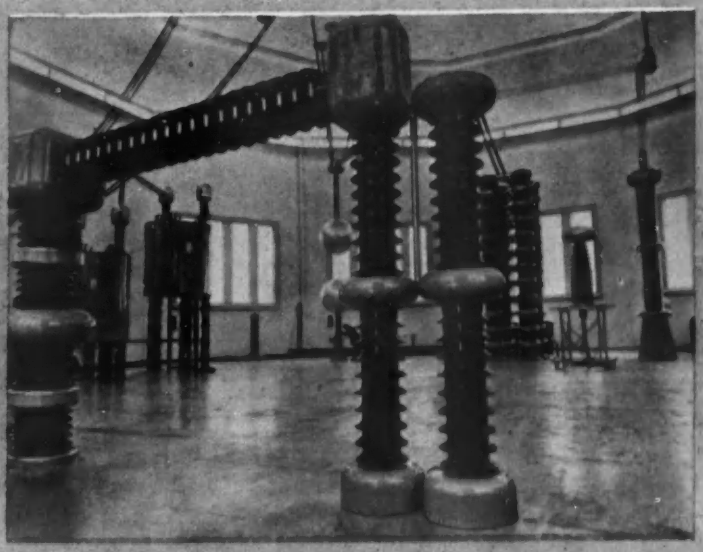
OSMASTON STREET, NOTTINGHAM

Boiling Plate

850w—6" diameter
SOLID PLATE
EMBEDDED ELEMENT
Volts—200/10 and
230/50

NORWAY

The 1,000,000 Volt D.C. Ferranti Testing Equipment can be seen in the foreground. All the Testing Equipment illustrated has been supplied by Ferranti Ltd. and is installed at the Research Laboratory of Standard Telefon og Kabelfabrik A/S, Oslo, Norway. It consists of:—
Foreground: 1,000,000 Volt D.C. Testing Equipment.
Left: 600 kV, 1200 kVA A.C. Testing Equipment.
Background: 12 Stage, 2,000,000 Volt Impulse Generator.
A 1500 mm sphere gap and surge potentiometer can also be seen in the background.

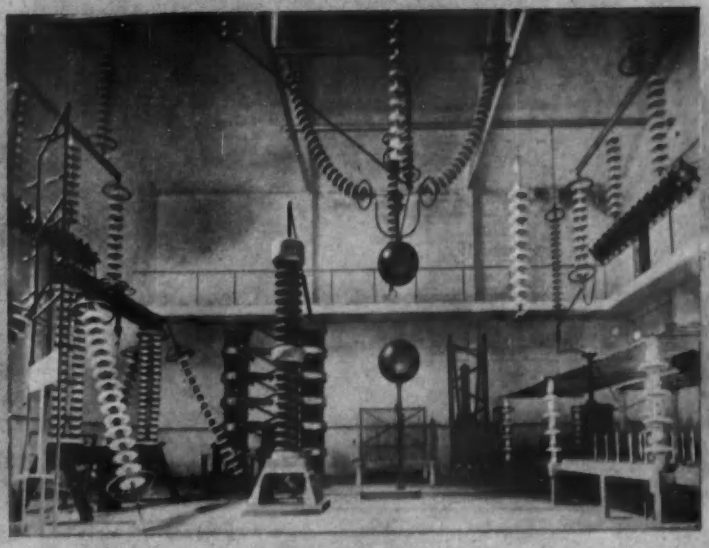


HIGH VOLTAGE TESTING EQUIPMENT

ARGENTINA

A 1,000,000 Volt Ferranti Impulse Generator installed in the Laboratories of Fabrica de Porcelana Armanino, Buenos Aires, Argentina.

This equipment produced the first ever 1,000,000 Volt arc in Argentina. Ferranti are also supplying to the same customer a 500,000 Volt, 250 kVA A.C. Testing Equipment.



FERRANTI ARE SPECIALISTS in the manufacture of A.C. and D.C. equipment for all kinds of routine and research testing, and are backed by over 70 years' experience in the manufacture and development of electrical apparatus.

FERRANTI

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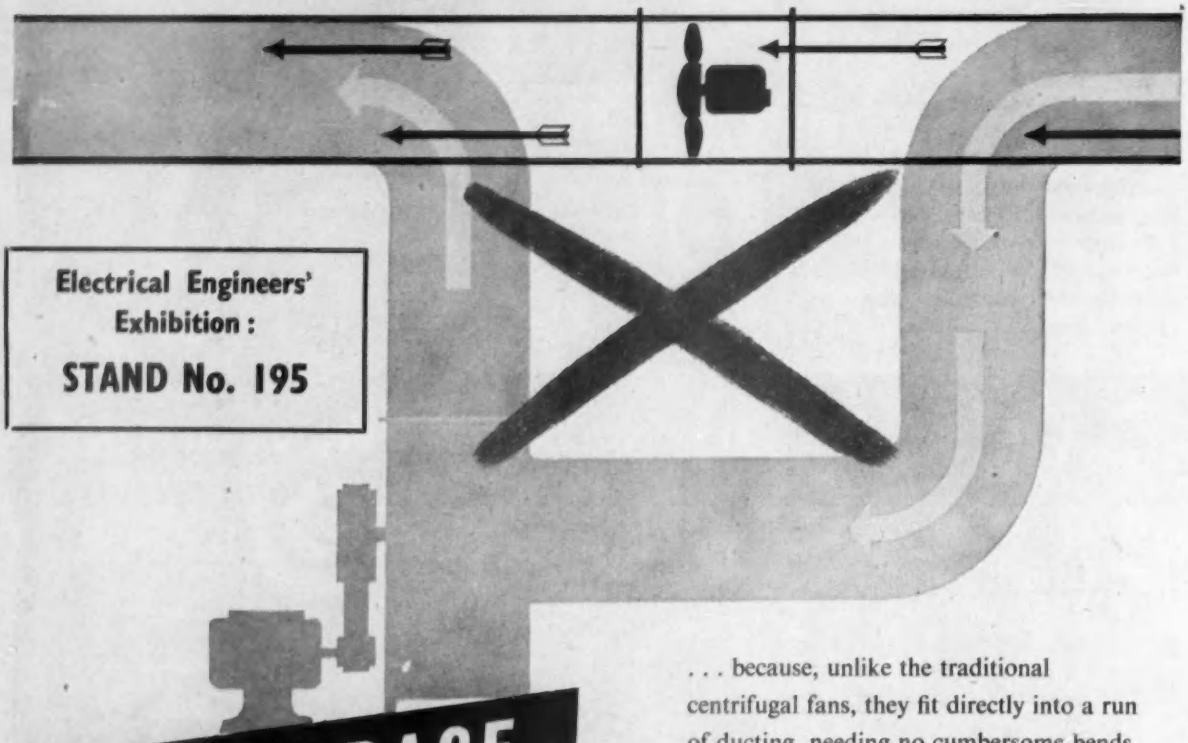
FT197/2

AEROFOIL FANS



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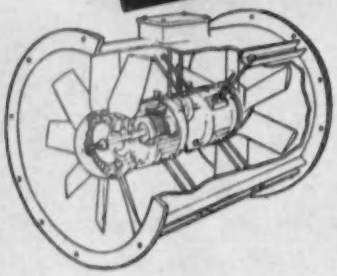
. . . because, unlike the traditional centrifugal fans, they fit directly into a run of ducting, needing no cumbersome bends, *taking up no floor space at all.*

SAVE MONEY

. . . because ease of installation saves initial cost, because they are generally more efficient, consuming less watts for any given duty.

Pressures up to 20" s.w.g. can be obtained by multi-staging standard contra-rotating units. Write for publication V.1089.



WOODS AEROFOIL FANS

WOODS OF COLCHESTER LIMITED, BRAISWICK WORKS, COLCHESTER

An associate company of The General Electric Company Ltd.

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Crompton 'NEW-RANGE'

The lighting fittings you helped to design

ELECTRICAL EQUIPMENT

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AUTOMATIC
STREET LIGHTING CONTROL

The up-to-date Fluorescent Lighting Scheme installed at Holborn is controlled by Horstmann Type "Q" Time Switches.
The time switch is designed to control two circuits and it can be arranged to reduce main lighting at or about midnight when traffic is less and full lighting is not essential, and finally to switch OFF at dawn.

A full range of HORSTMANN Time Switches is available to meet all the demands of modern public lighting control, and 50 years of design and manufacturing experience ensures unfailing reliability under varying conditions of service.

HORSTMANN

Photograph by courtesy of the General Electric Company Ltd.

THE HORSTMANN GEAR CO LTD
NEWBRIDGE WORKS, BATH, ENGLAND. TEL: 7241

THE
NEW "MIDCOIL"
VARIABLE OUTPUT **TRANSFORMER**

with superfine voltage control and

OUTPUTS UP TO 20 kVA

Example : 0-280 volts, variable from zero to full voltage in finely graded steps giving control throughout the range to within 0·12 volt at full load, with extremely

GOOD REGULATION

Of particular interest to **Designers** of test equipment and with many other **industrial** uses such as electrical furnaces, etc.

FULL DETAILS AND PRICES ON REQUEST

Other types include : **Low Voltage** Auto Transformers, **3 Phase** and **Phase Conversion** types, designed and produced to customers' specifications.

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A Quality Product from

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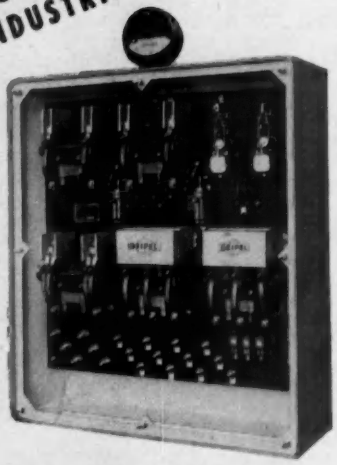
CONTROL GEAR SPECIALISTS FOR ALL INDUSTRIAL PURPOSES



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Please consult our experienced technical advisory service.

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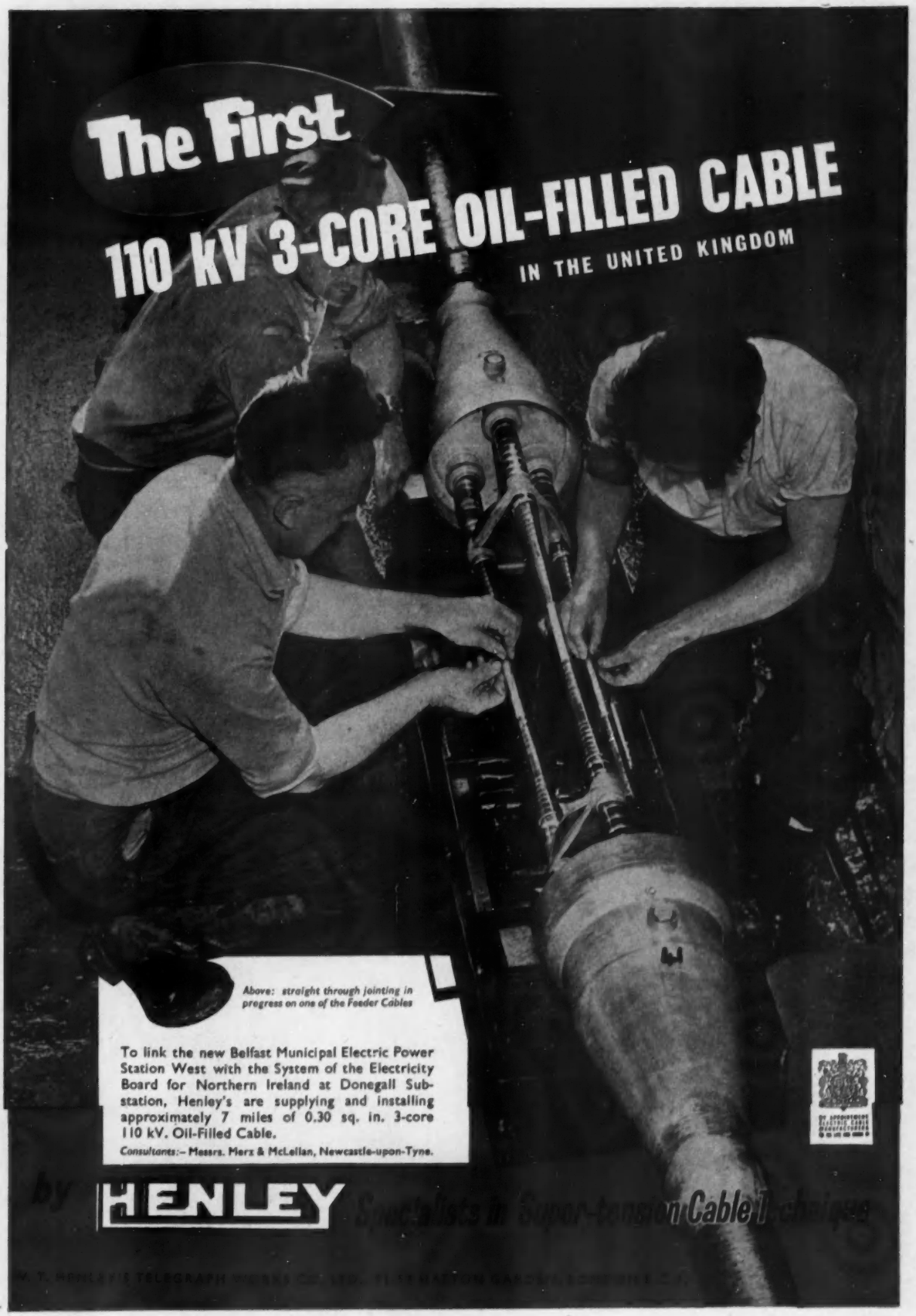
Telephone: HOP 0594


The First
110 kV 3-CORE OIL-FILLED CABLE
IN THE UNITED KINGDOM
Above: straight through jointing in progress on one of the Feeder Cables
To link the new Belfast Municipal Electric Power Station West with the System of the Electricity Board for Northern Ireland at Donegall Sub-station, Henley's are supplying and installing approximately 7 miles of 0.30 sq. in. 3-core 110 kV. Oil-Filled Cable.
Consultants:– Messrs. Merz & McLellan, Newcastle-upon-Tyne.
by HENLEY
Specialists in Super-tension Cable Techniques

May we give you a piece of our mind ?

Our technicians are always glad to give you the benefit of their experience. Why not get together before planning that electrical job? The chances are you will save yourself time and trouble.

The BICC Technical Advisory Service has been helping solve customers' problems for many years. Advice is given on the selection, application and installation of electric cables and wires for every purpose—and on the wide range of associated equipment manufactured by BICC.

This service of course is entirely without obligation.

BICC

Technical Advisory Service

BI Callender's

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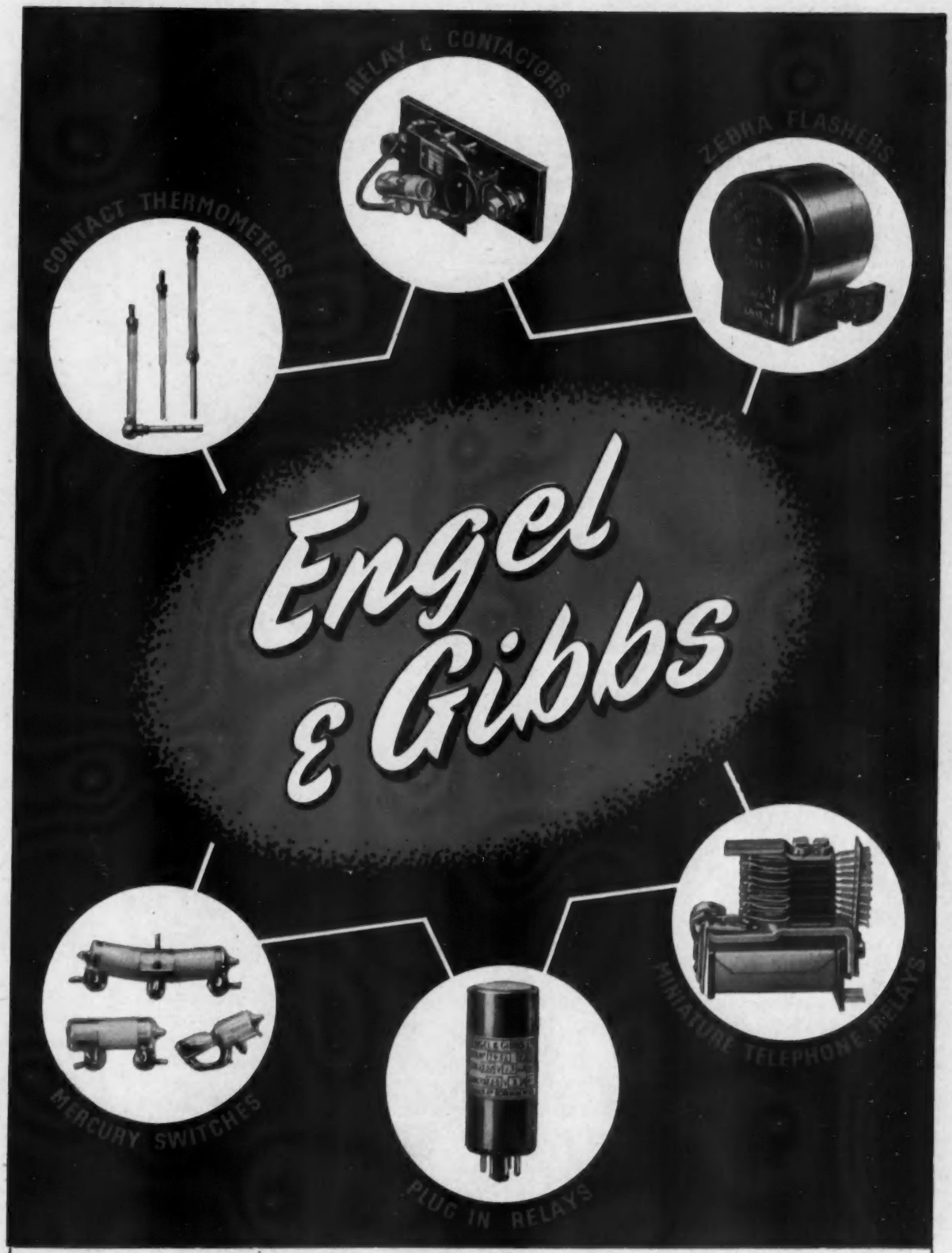

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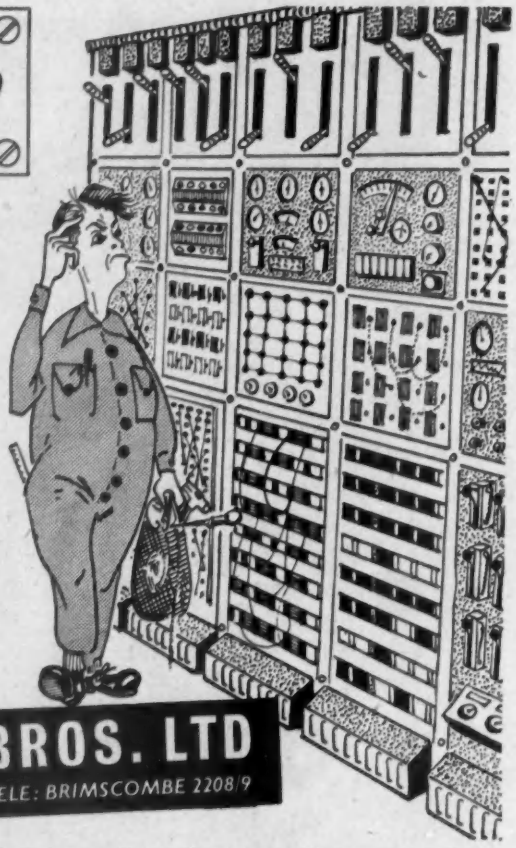

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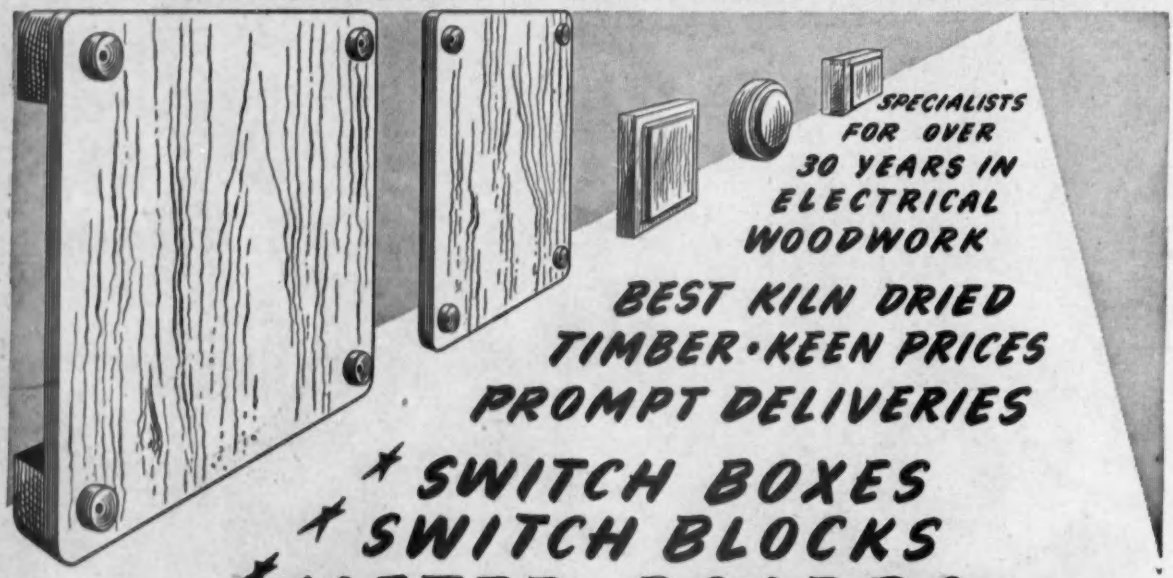

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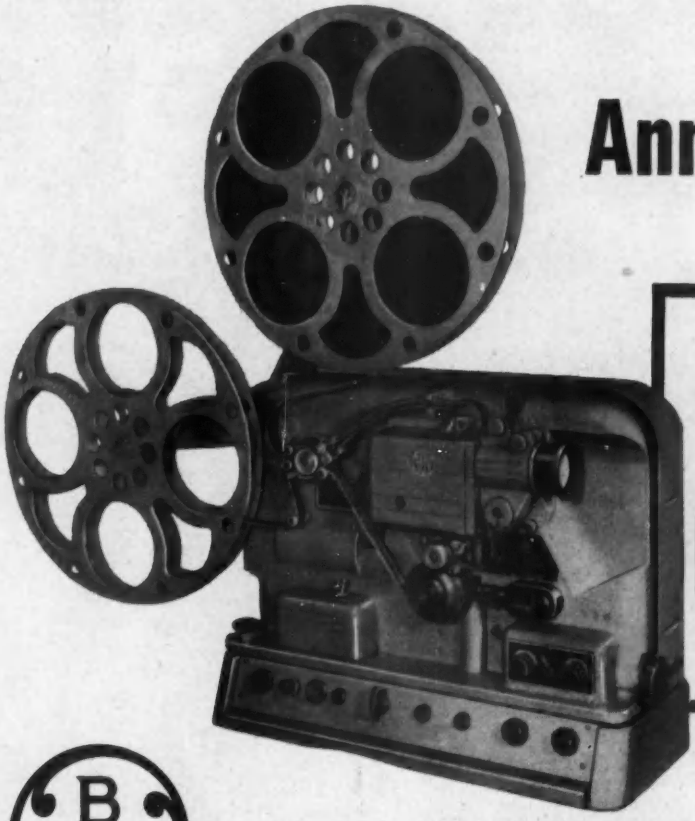

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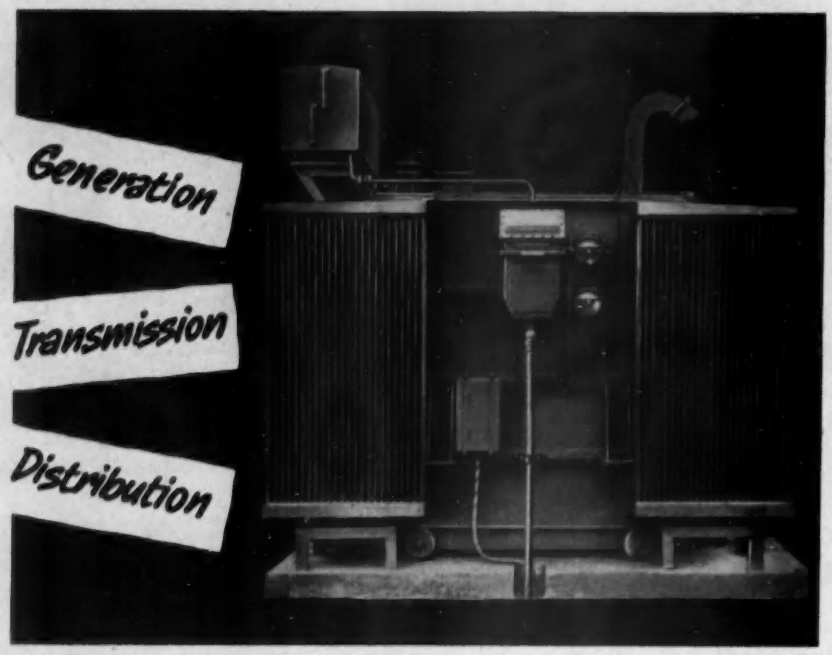

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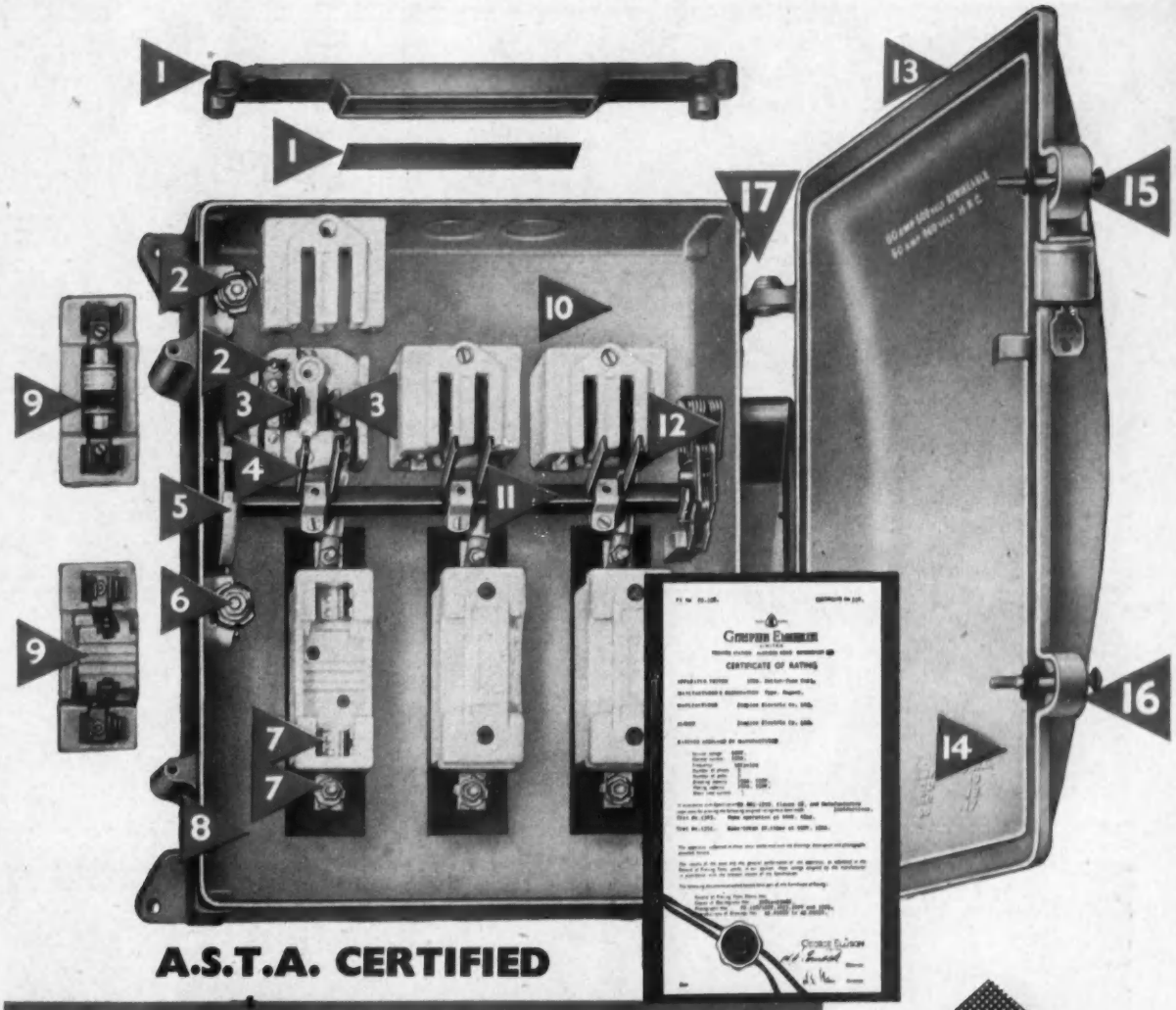

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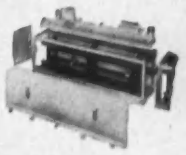

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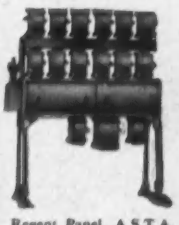

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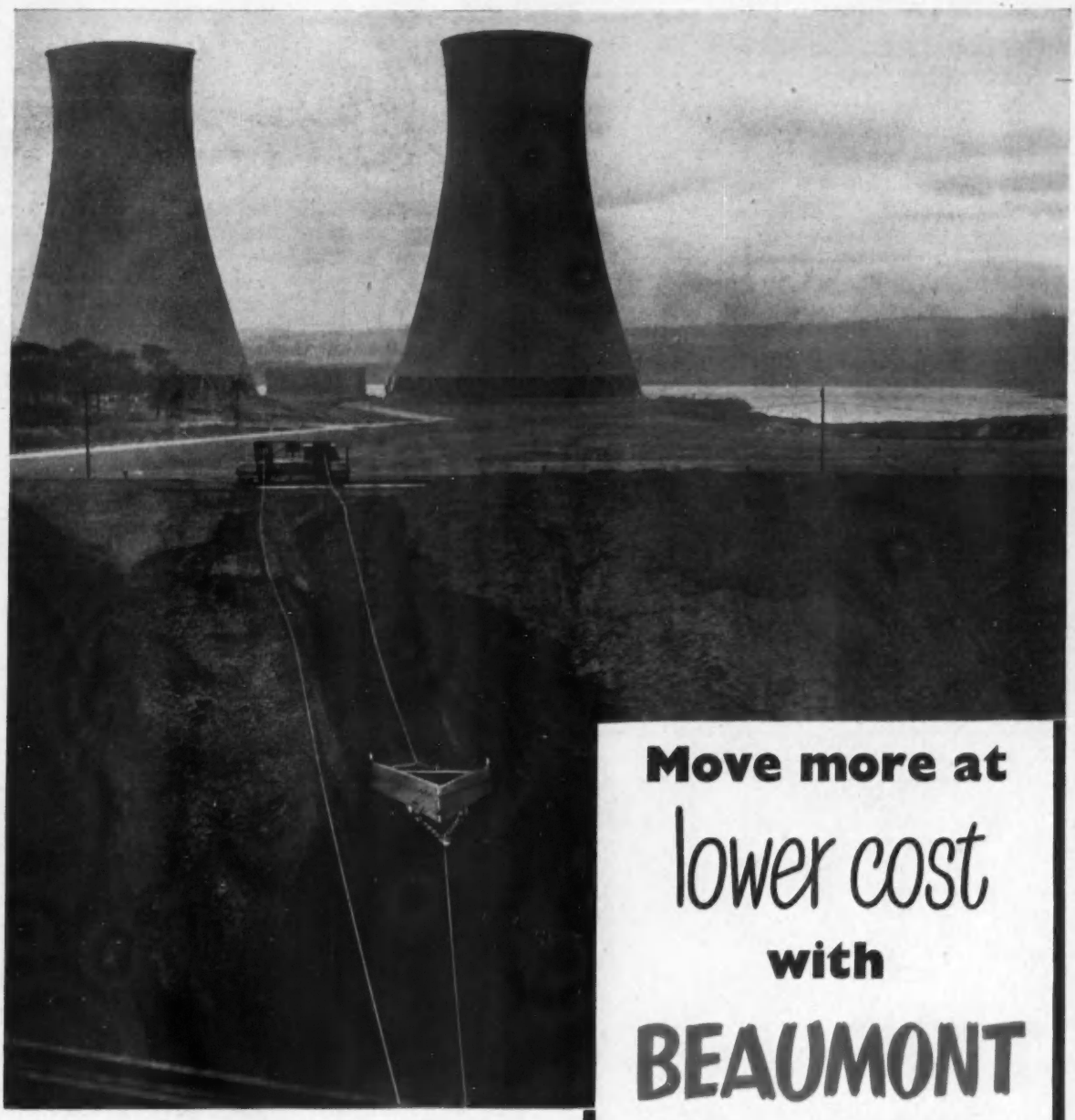

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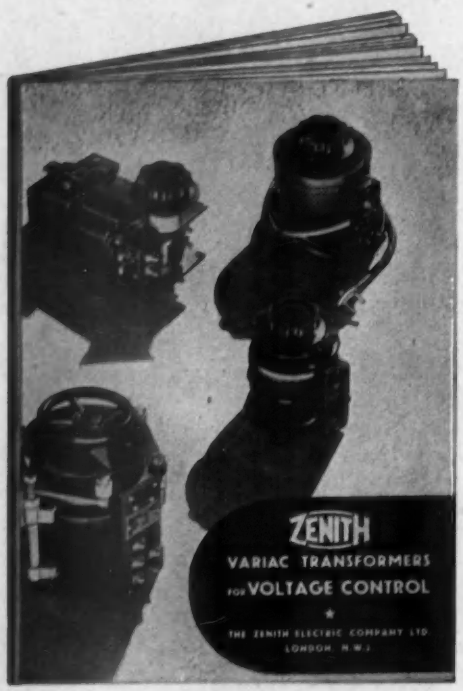

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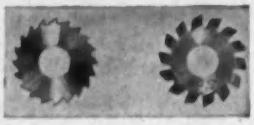

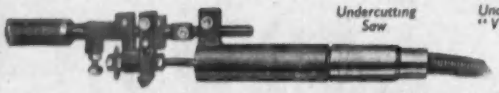

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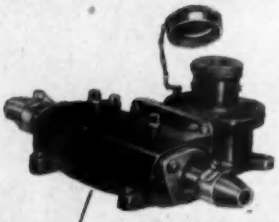

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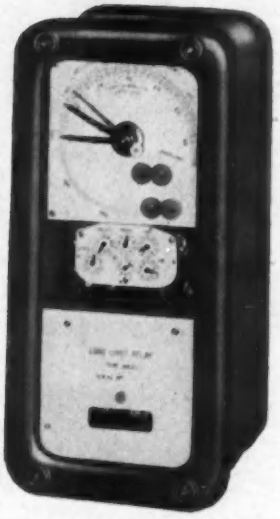

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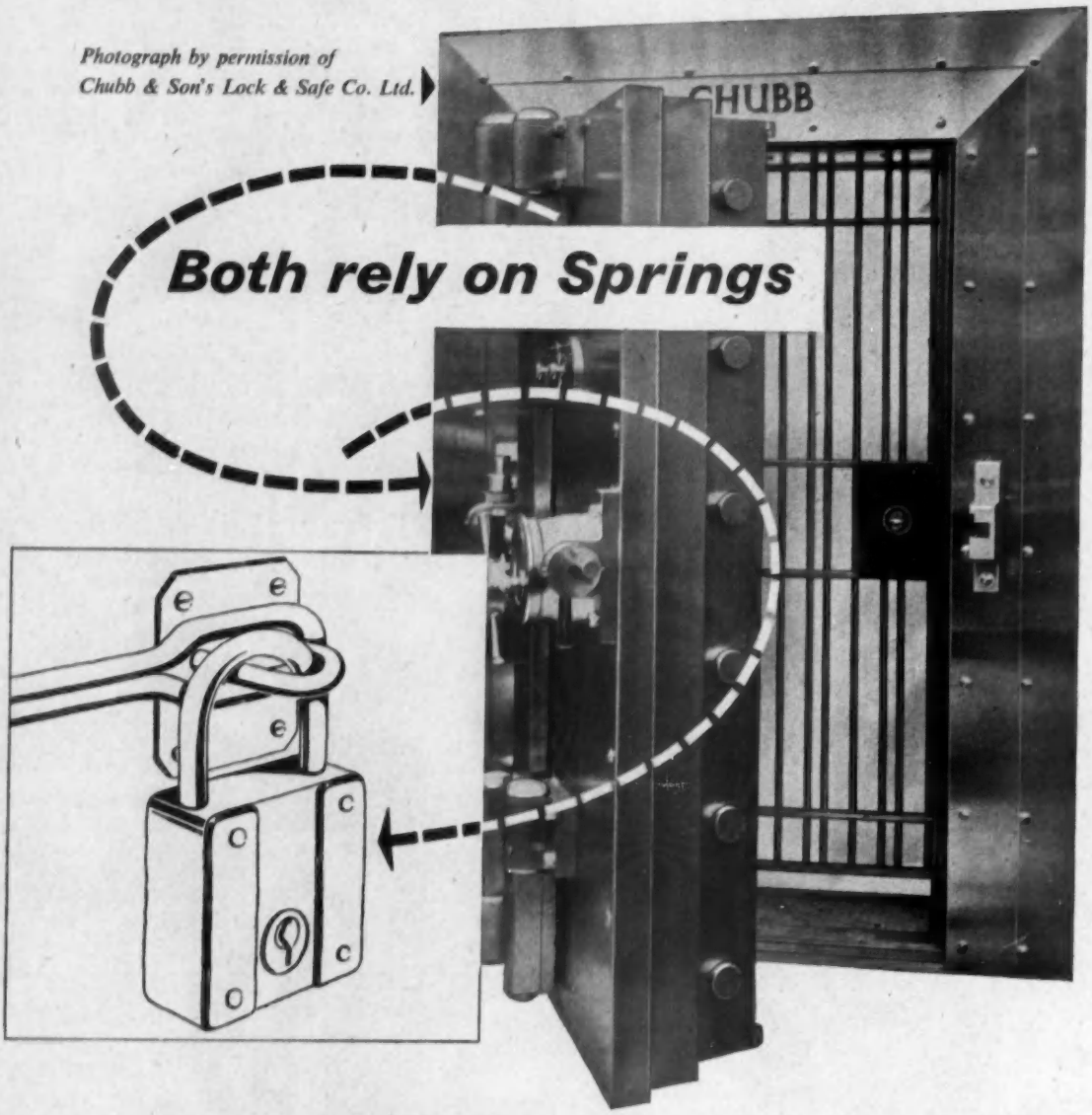

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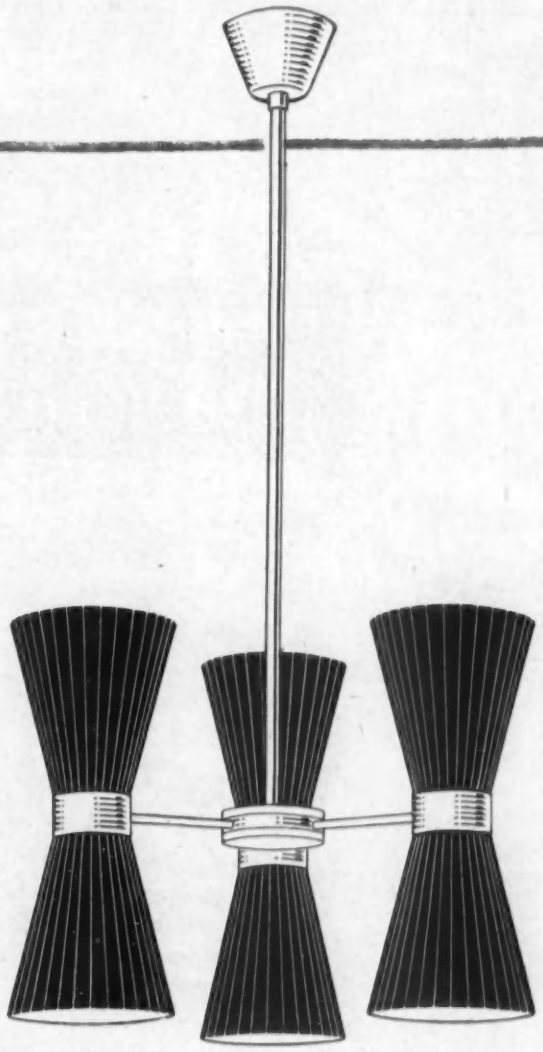

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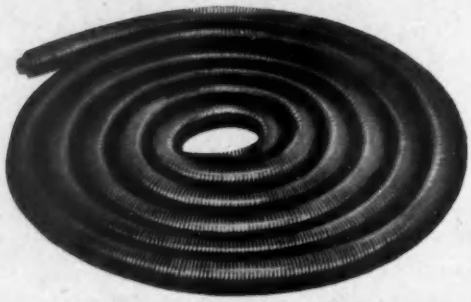

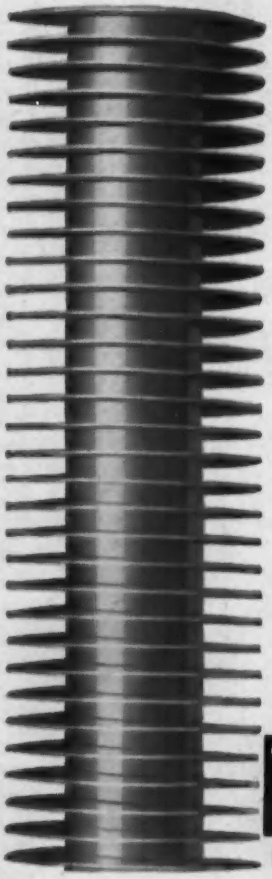

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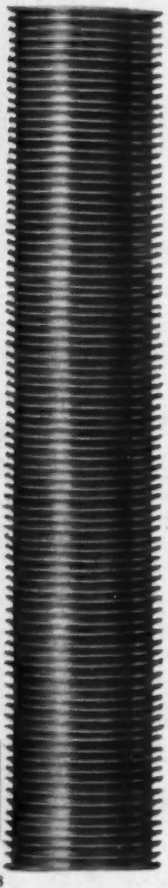

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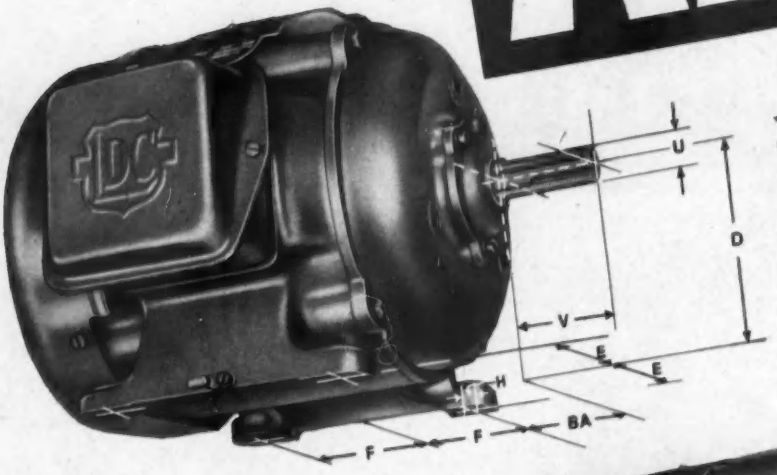

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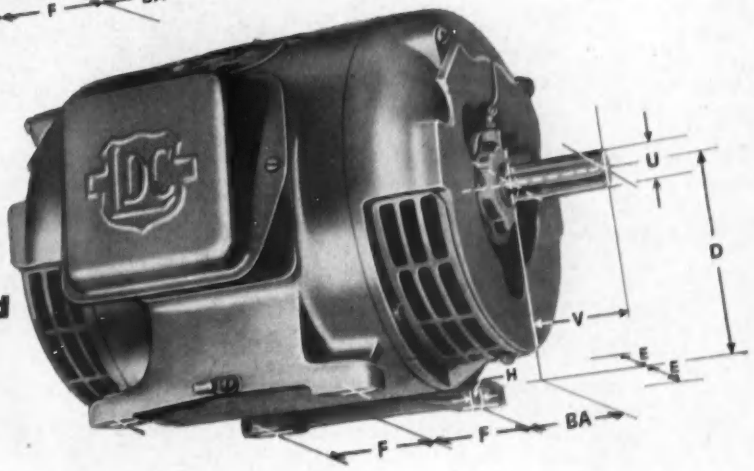

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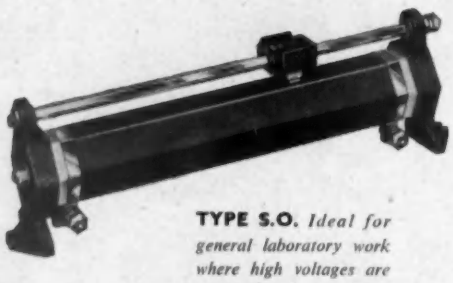

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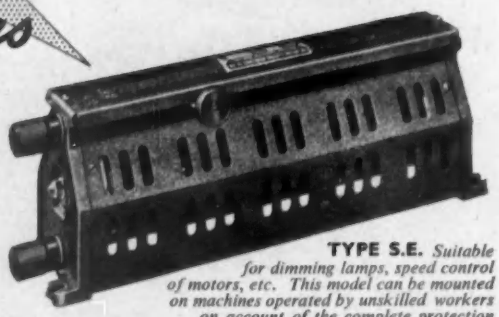

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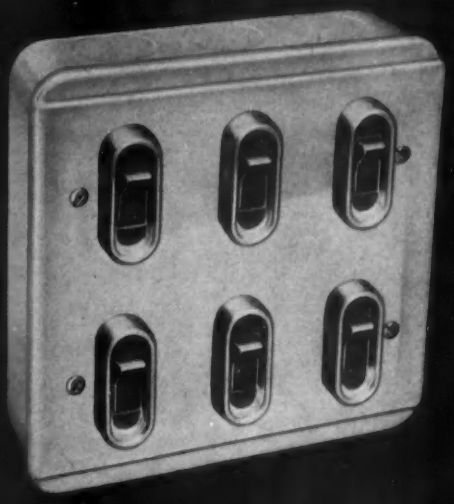

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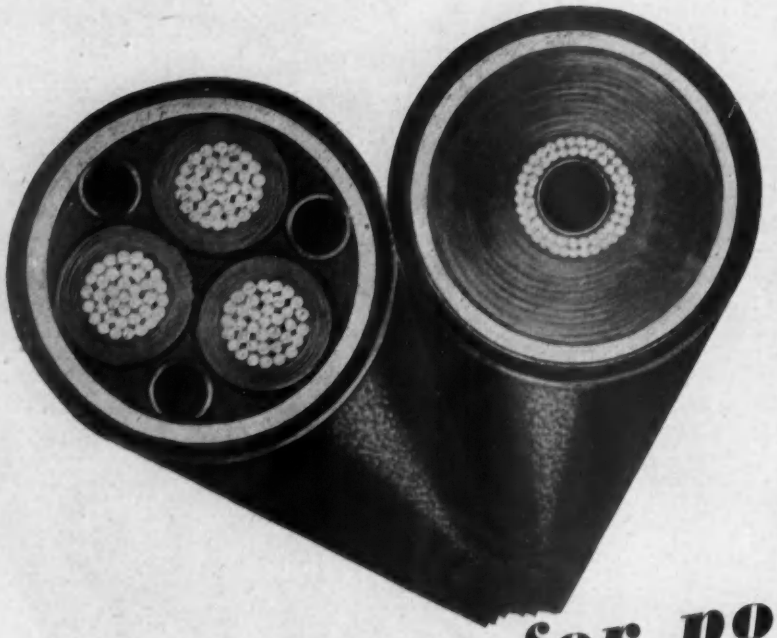

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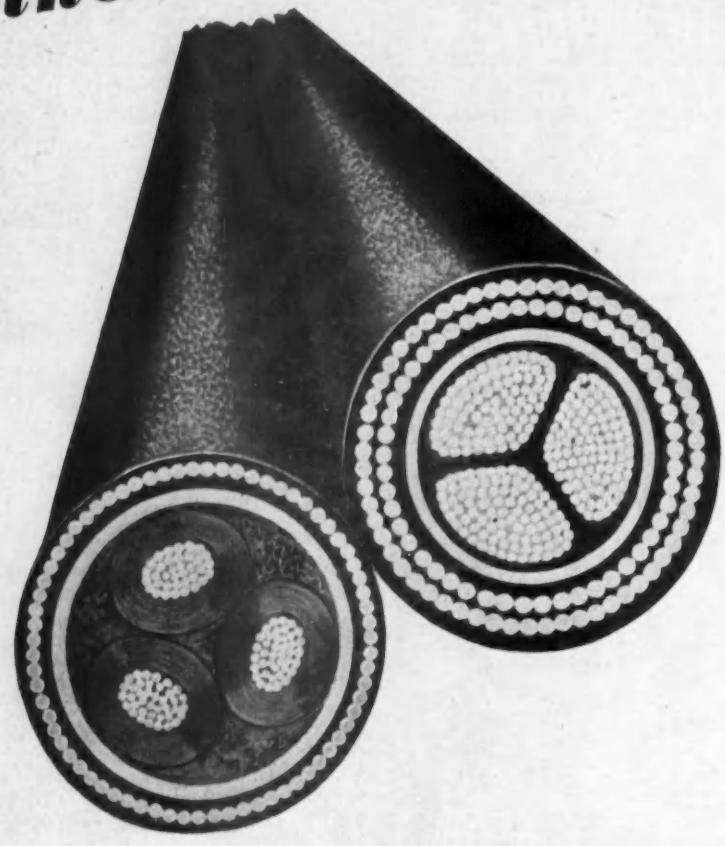

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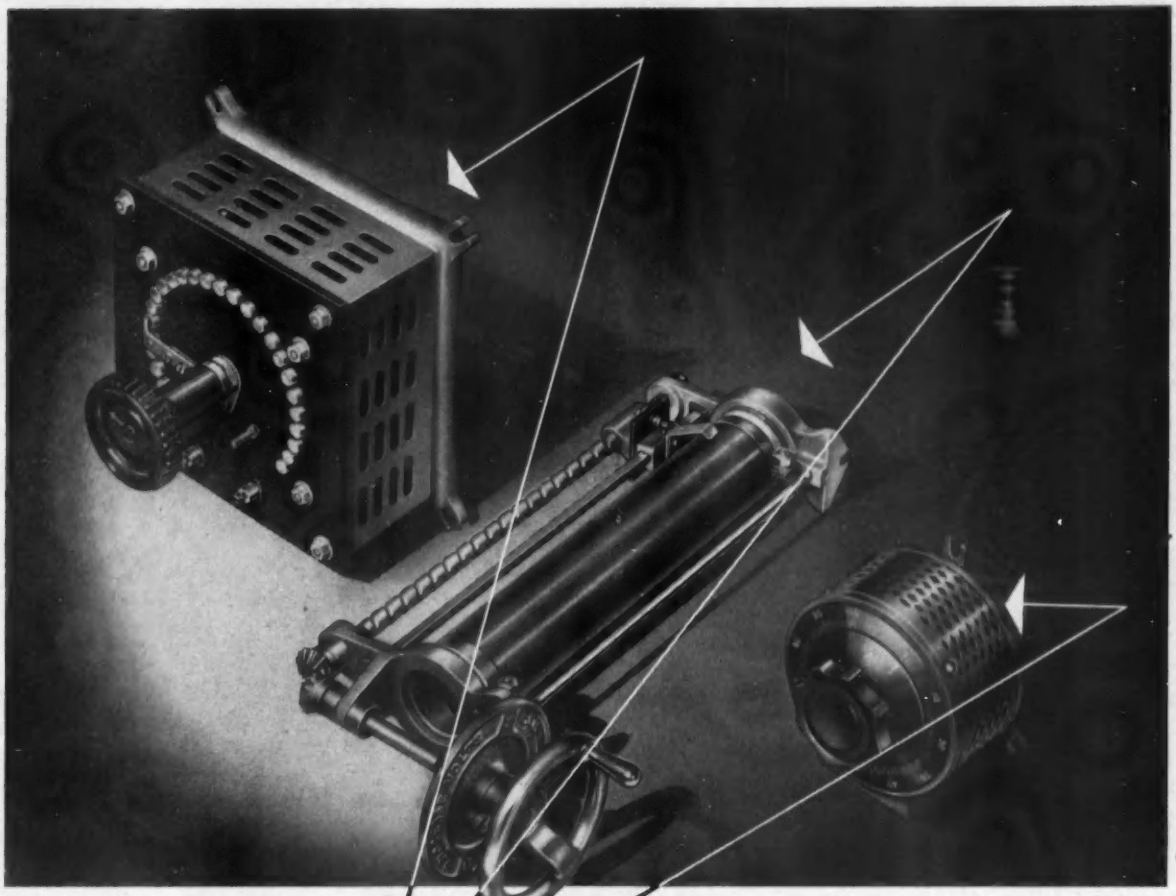

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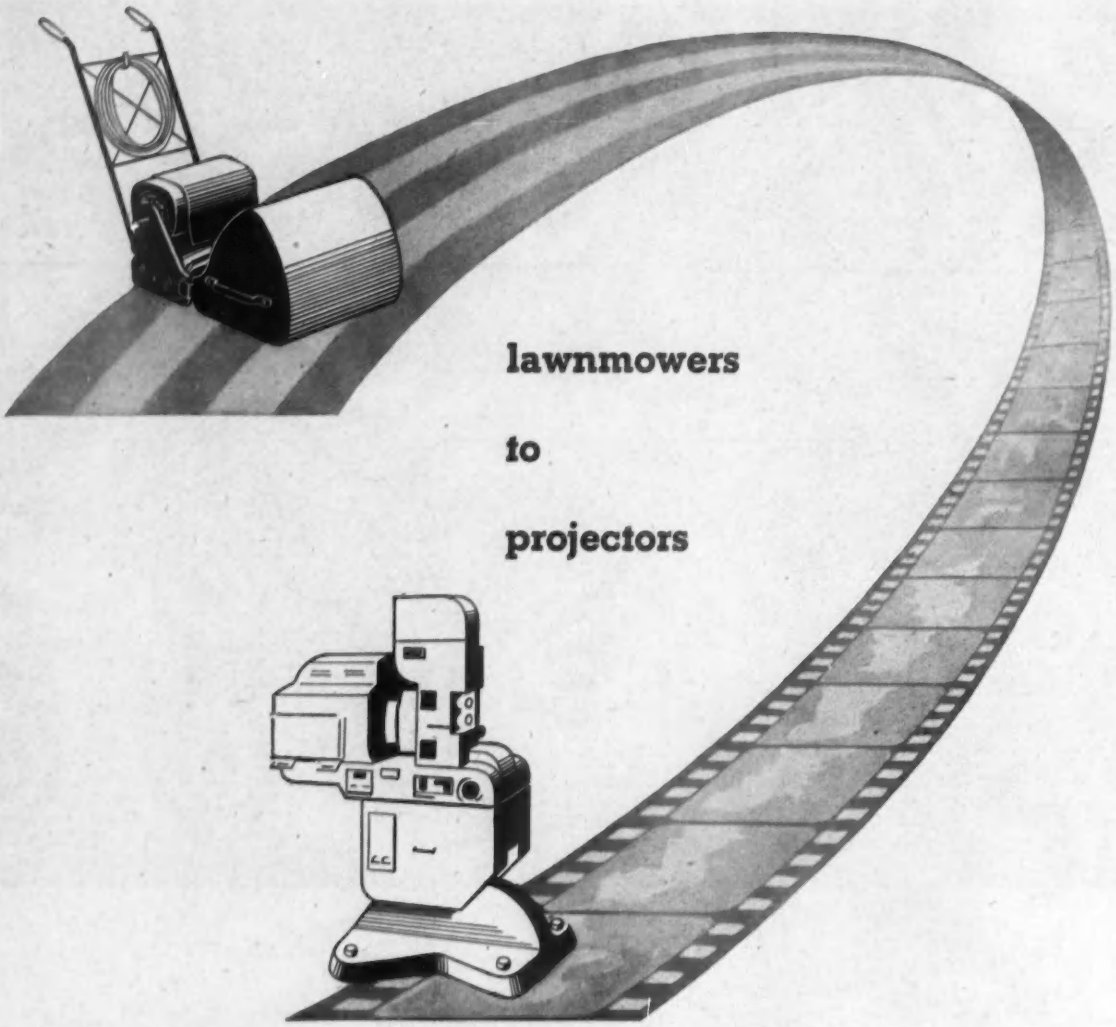

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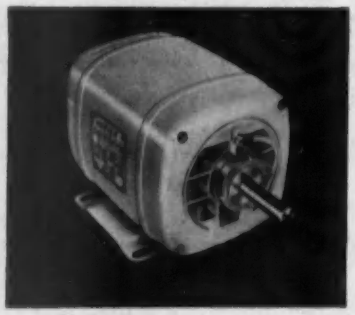

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ELECTRICAL TIMES

ESTABLISHED 1891

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PURCHASE TAX PROSPECTS

Traders welcomed the announcement last year, after purchase tax changes in January, that the Budget following two months later would propose no further alterations in p.t. rates. It lifted the doubly oppressive shadow which the prospect of such alterations always casts before: public unwillingness to buy, in case the advantage of a reduction is just missed, and the retailers' unwillingness to stock, for fear of forfeiting tax already paid, should a reduction indeed take place. Now the Chancellor of the Exchequer has said that the January announcement of minor p.t. changes, which became effective last week, is not to be regarded as excluding the possibility of further alterations this year. He has proclaimed the opinion that in future there should not be a regular time of the year for such changes. Traders are likely to regard this as a retrograde step: though they may not have to fear a buying strike under such an arrangement, they are once more fully exposed to the danger of losing previously paid tax when reductions are announced, and the task of securing protection by special sale or return schemes is made much harder. This new decision of the Chancellor stands in striking contrast to the recommendations of the Hutton Committee which investigated the whole question of tax paid stocks. Change only occasionally and at the time of the Budget, their report said. But this cloud has the proverbial silver lining. It reintroduces some hope for the electrical industry that this year may yet see trade-encouraging purchase tax reductions on electrical goods. Optimism in this direction is possibly misplaced but at least the Beaver Committee's recommendation for tax-free electric fires as a contribution to clean air must weigh heavily with the Government. Perhaps the position here will be clearer after tomorrow's debate on Mr Gerald Nabarro's private member's Bill based on the Beaver Committee's report, for this may elicit some more definite indication of the Government's intentions concerning the "Clean Air Policy." At the time of writing, there has only been acceptance of an unspecified majority of the Beaver Committee's recommendations "in principle." It is clearly to the advantage of any such policy that electrical methods of heating be encouraged, and a lower rate of p.t. on fires can be effective to this end.

MATERIAL INCREASE

During 1954, electrical manufacturers suffered more from rises in the cost of basic materials than did most firms engaged in general engineering. This continued a trend of some years standing, and the magnitude of the effect is shown

in the basic materials price index which is periodically issued by the Board of Trade. Last December the index for electrical engineering materials was 168·3, based on June 1949, as 100; the corresponding figure for general mechanical engineering materials was 155·7. These index figures showed advances of 11·0 and 8·1 respectively on those for December 1953, and the underlying reasons for both advances are not far to seek. Iron and steel prices went up during the year, and this had a considerable effect on both indices, but the far steeper rise in copper prices had its biggest reaction on the electrical materials index, which jumped almost 9 points between August and the end of the year. It seems from negotiations at present being carried on between the leading Rhodesian copper producers, that manufacturers are not alone in viewing with concern the present high level of copper prices and their variability. Producers realise that although it is unlikely that even the high prices now reached have had any marked effect on electrical machine design, the search for satisfactory substitutes is automatically stimulated. Although the present price peaks may give way to lower figures, the long-term trend for copper seems bound to continue upwards for the foreseeable future.

CANADA'S FUTURE POWER

With 16½m h.p. of hydro-electric plant now in commission, representing about a quarter of its known resources, Canada is now having to look to the less readily accessible potential hydro-electric sites for power. That there is no slackening in the demand is shown by last year's record figure of installed plant amounting to one and three-quarter million h.p., a large proportion of which was provided by the 450,000 h.p. Kemano-Kitimat project for aluminium production. Also under consideration is a second major scheme on the borders of Yukon territory and British Columbia with a possible ultimate capacity of 4·3m h.p., again destined for metallurgical purposes. But these large developments are limited, and are necessarily restricted for raw material transport reasons, to coastal regions. It is in the interior northern and north-eastern sections of the continent that many future schemes must lie. There, difficult living conditions and meagre transport facilities are not conducive to the establishment of townships and power will have to be transmitted large distances to areas better suited for industry. This will inevitably require the use of very high voltage power systems, and already work is proceeding on the building of a 345 kV line 100 miles long to supply power from Bridge River to Vancouver. Although this particular line is in the western section, it is, undoubtedly, only the forerunner of many other similar higher voltage systems which will be required to make available, where it is required, the still untapped potential of Canada's remote rivers and lakes.

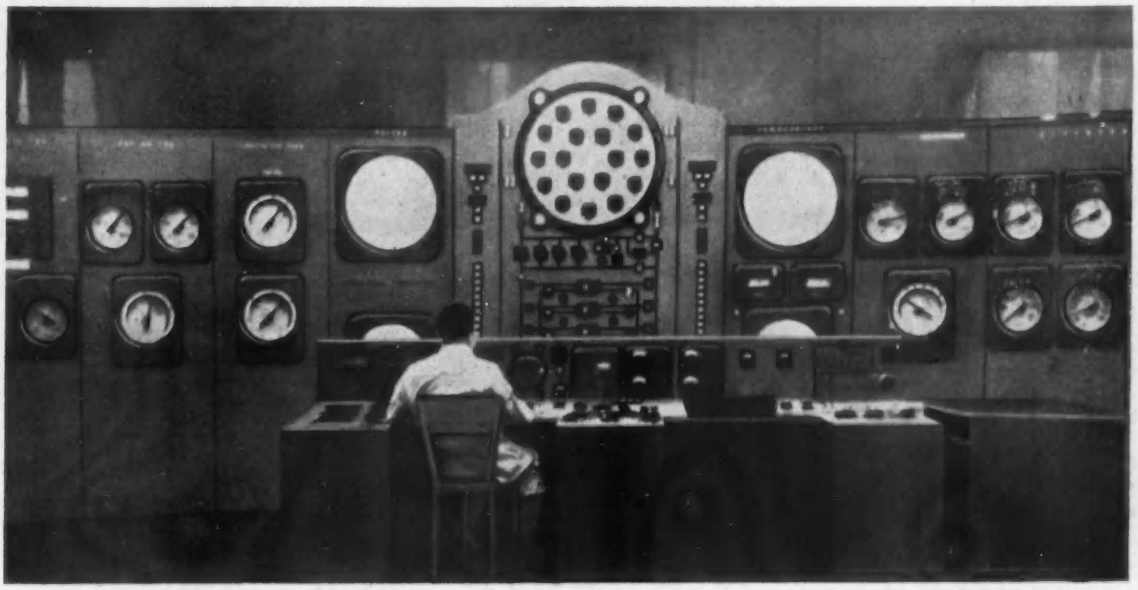
HEAT WAVE PEAKS

Excessively hot weather can bring as many problems to the supply engineer overseas as unusually cold weather to his colleague in this country. It produces a sharp peak which shows up distribution shortcomings even when generation facilities can cope with the demand. These are the main conclusions to be drawn from a 1954 heat-wave which afflicted the southern states of the U.S.A., and which sent the peaks of many supply company load curves rocketing to show a year's increase of more than 20%. In a review of the resulting situation, *Electrical World* gives story after story of emergency work on distribution reinforcement as air conditioning plant, in many cases in the form of small window units, began to work continuously, so that the advantage of diversity was lost. British supply engineers are all too familiar with the problems of the peak, but these American experiences suggest that there are some aspects they have still to meet. There is not in Britain, for instance, the disadvantage that because of very high ambient temperatures, transformers have their lowest capacity just when maximum loadings are imposed. Moreover, the extra cold weather load is at least largely resistive. In America, the demand that the heat-wave brings is mostly motorised. Power factor suffers severely, and, as a result, voltage regulation troubles due to heavy loadings are aggravated. In many cases there is a strongly marked proportionality between temperature and consumer complaints about voltage; here at least, the consumers tend to get hot tempered only in cooler weather. Because of the trouble with reactive voltage drops and quadrature current, considerable attention has been given to the installation of both series and shunt capacitors, and a measure of success has been achieved with these as a means of increasing the effective kilowatt capacity of badly overloaded distribution networks. The development answer to this peak problem includes, to complete the contrast, the promotion of electrical space heating.

ELECTRICAL CENTRE

Firms with predominantly electrical interests accounted for one-tenth of the country's general wholesale business during 1950. This leading electrical statistic from the voluminous final section of the Census of Distribution, published last week, emphasises again the strength of the position electrical trading occupies in the business life of the country. It is not easy to extrapolate these 1950 figures to the present time, but in view of the increased building programme and the more benevolent public and official approach to things electrical, it seems probable that today electrical wholesaling has an even bigger share of the cake than five years ago though some allowance must be made for the growth of direct manufacture-retailer dealing. The overall figures are subjected to considerable analysis in the report, and some of the results are dealt with on a later page of this issue. One further point does seem worth comment here, however. The ELECTRICAL TIMES is edited from offices standing at the boundary of the City of Westminster and the Borough of Holborn. In those two municipalities, the census shows, are concentrated almost 10% of the country's electrical wholesalers: 115 out of a total in Great Britain of 1,282. In terms of sales, the pre-eminence of the area is even more outstanding: it was responsible in 1950 for almost £31m out of a grand total of £127m. The census leaves no doubt of the situation of the heart of electrical trading.

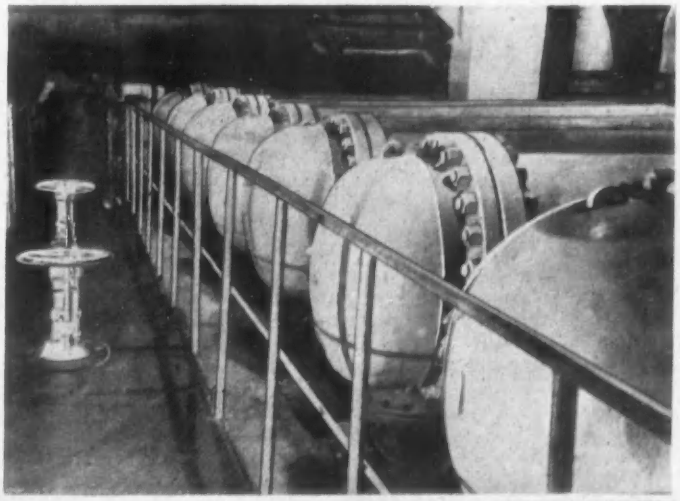
Meteor

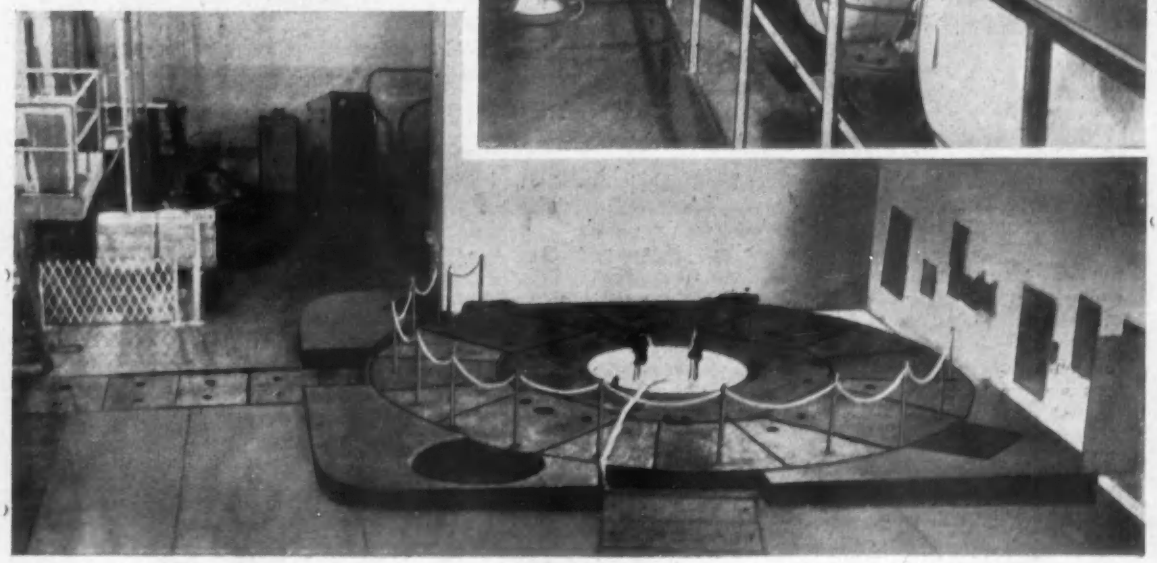


SOVIET ATOM POWER STATION

SHOWN in these photographs are some views of the Soviet Union's first industrial atomic-energy power station, with a reported capacity of 5 MW. The project was sponsored by the Soviet Academy of Science. Above is shown the control desk and it would appear reasonable to assume that the large circular indicator gives the position of the control system of the pile itself. The picture at the bottom of the page shows the top of the pile itself—or, as quoted in the original text, the "atomic boiler." It will be noticed that the diameter is not very large. Protection of station personnel is by means of thick concrete walls. The third photograph shows a group of "hydraulic heat-exchanger cylinders."

It thus seems that the reactor is of the water moderated type. It is claimed that this reactor is generating power being used by industry and agriculture in the surrounding district. The claim is also made that this is the first real step in the direction of using atomic power for peaceful purposes.





Close-joint Conduit has Advantages

EARTH CONTINUITY IMPEDANCE CONSIDERATIONS SUPPORT REVISED JUDGMENT

By T. C. GILBERT, M.I.E.E.

IT is always interesting to look back over a number of years and see how far prophesies, prognostications and pious hopes have come to fruition, and how many have been relegated to the limbo of lost and forgotten causes, whatever their high hopes at the time of first expounding. It may, in some cases, be rather unkind to drag into the light of day opinions expressed by those lacking our latter-day knowledge, but, on the other hand, salutary to those of us inclined to be somewhat dogmatic in our pronouncements, as a warning lest our opinions be later quoted against us. In these days of rapid development, anything

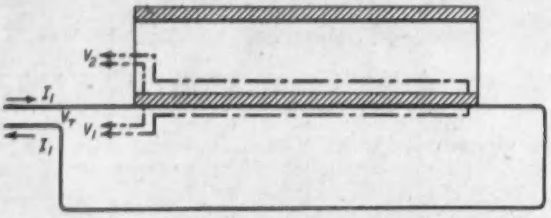


Fig. 1. Currents and voltages when impedance is measured before drawing cables into conduit, self impedance V_1/I_1, mutual impedance V_2/I_1, circuit impedance V_T/I_1

over ten years would seem a reasonable period to choose, and recent re-reading of a paper and discussion recorded in the Journal of the I.E.E. for December, 1943, has provided considerable food for thought. The paper was entitled "The Future of the Domestic Wiring Installation", with four eminent authors, and apparently everybody who was anybody in the industry made a contribution to the discussion.

Space will not permit our roving over the whole field visualised in the paper, but several points remain alive today; the ring circuit featured prominently in both paper and discussion, and so far as can be ascertained is the only recommendation to receive later official approval with widespread adoption. However, interest lies mainly in the opinions expressed regarding steel conduits at that time, in the light of present-day requirements for an impedance limit to replace the old resistance limit, and attention will be directed to this section. One paragraph may be lifted directly from the paper:

"The various types of wiring at present available have all been considered, and the conclusion is reached that for this class of work in new houses and flats there is nothing to equal good-quality grip-joint light-gauge tubing. Many thousands of dwellings have been equipped with this system, which has proved to be quick, economical and lasting. It has been cast into concrete floors and into brickwork. Every job has been tested for continuity on completion and one year later, and the tests are, on the whole, better than with heavy-gauge screwed conduit. The reluctance of the trade to use light-gauge conduit, in its right place, is incomprehensible, except on the assumption that they never really tried it out. In the authors' experience it has so many advantages for housing work that even if it showed no financial gain they would continue to use it."

Light Gauge Disliked

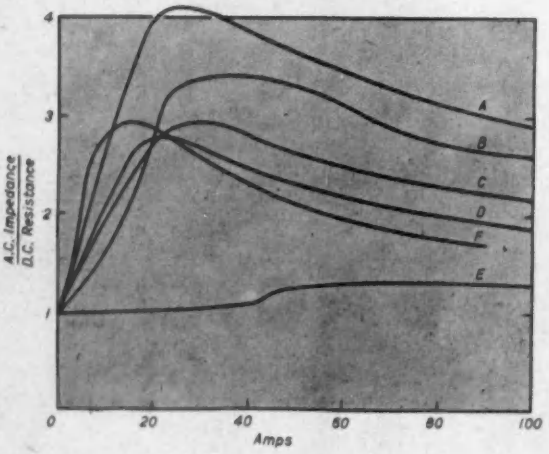
Naturally, this led to considerable difference of opinion in the course of the discussion, but the majority appeared to dislike light-gauge conduits. Only one expressed opinion will be quoted—of interest because the engineer concerned has been engaged in the investigation of continuity of steel conduit joints, and this reads as follows:

"In an E.R.A. investigation which has been in progress for the last 2 to 3 years, grip junction boxes showed a mean resistance 30% greater than that of the corresponding screwed boxes, and grip couplers gave value about 50% higher than screwed couplers. After a period of 2½ years the resistances of screwed boxes and screwed couplers have increased by about 15% and those of the corresponding grip fittings by about 30%. Some of the joints were installed in surface runs and some cast in concrete after the initial measurements, but no significant difference was observed between the two conditions. It should be emphasised that the comparison applies to properly installed runs with well made joints. It has been found in the course of the tests that pin-grip fittings are critically dependent upon the complete tightening of the set-screw; from that point of view I should prefer to see the authors' recommendations regarding the use of grip-type conduit fittings confined to lug-grip fittings, and in addition it should *exclude specifically the so-called close-joint tubing.*" (The italics are the writer's).

In their reply to the discussion, the authors were at pains to point out that their reference to light-gauge tubing

Fig. 2. Impedance of typical conduits. The impedance measured is that given by V_1/I_1 in Fig. 1

A: 1 in. mild steel, welded, circular, heavy gauge.
B: ¾ in. mild steel, circular, solid drawn.
C: ¾ in. mild steel, circular, welded, heavy gauge.
D: mild steel, circular, welded, light gauge.
E: ¾ in. mild steel, circular, split.
F: ¾ in. mild steel, circular, welded, light gauge.



meant only the welded or brazed variety, and definitely not the split-seam type; in their words:

"Conduit, as generally used, falls into three main classes; (1) heavy-gauge (welded joint) with screwed connections; (2) light-gauge (brazed or welded joint) with lug-grip connections; (3) light-gauge (close joint) often used with pin-grips or even slip connections. Class (3) conduit is merely a folded tube, the joint being close enough to exclude dirt or other foreign matter . . . no attempt has usually been made to get continuity. If, however, we are going to insist on electrical continuity in our conduit system then we must adopt either (1) or (2); it is system (2) which the paper recommends . . . E.R.A. tests bear out these contentions and will surely convince all except those who are not willing to be convinced."

The present writer was one of those cut to the quick by these last rather unkind words, having been for a long time unconvinced by claims made for steel conduit continuity in view of independent tests concerning the behaviour of this material when the impedance factor was applied, an obvious problem in connection with all magnetic circuits where a.c. is employed. It has meant waiting a long time for official confirmation of these, then, most unpopular views, but the recent issue of E.R.A. Reports V/T111 and V/T114 provides this confirmation in good measure, pressed down and running over. The conclusions of the former report indicate quite clearly that the impedance of a steel conduit run may easily be ten times the d.c. resistance under certain conditions of fault; in the most favourable circumstances it will probably be five or six times what we were so easily satisfied with in the old days. How do these official findings confirm or disrupt the views expressed above in connection with various types of conduit?

Conduit Impedance

Space will permit only the briefest examination of the conclusions reached in the Reports, their recommendations as to methods of testing in the future, or more important still, the recent official interpretation of Regulation No. 1003 (A) regarding methods to be used for ascertaining the impedance factor of a steel conduit run. It is, however, very interesting to examine one or two diagrams from the E.R.A. Report V/T111, "The Impedance of Steel Conduit used as an Earth-Continuity Conductor", reproduced here as Fig. 1 and 2. The latter shows the much-maligned close-joint conduit in a new and favourable light in comparison with solid drawn or welded conduits; with the latter, the a.c. impedance/d.c. resistance ratio may be anything between 3 and 4, but with close-joint conduit, Curve E, it is almost equal, and the magnitude of the testing current will be noted.

Does this mean that split-seam conduit will come into more general use? It should, if we pay any attention to the Reports as to the necessity for initiating costly and involved tests with steel conduits, heavy and light currents, a.c. and d.c. Even so, although the result of such tests may ensure acceptance at the time when they are made, how are we able to guarantee a continuance of a satisfactory value during the life of an installation in view of the inescapable increase in resistance recorded in the official tests, some of which have been mentioned above? It is suggested in some quarters that the easiest and most effective way out of the difficulty will be to draw in a bare copper earth continuity conductor with the circuit wiring, ignoring the conductance of the steel conduit, and the writer would support this; preferably with the proviso that this earth conductor should be lightly insulated in order to ensure selective operation of earth-leakage protective devices where installed.

Although the writer accords appreciation of the careful and valuable work put into the compilation of E.R.A. Report V/T111, this has, in his opinion, one serious deficiency—it records no tests on brazed conduits, but only on solid drawn, welded and close-joint. After all, B.S. 31 states: "Steel conduits shall be either close-joint, *brazed*, welded or solid drawn. . . ." and brazed conduit has certainly been widely used in the light gauges. It is thought that the result of impedance tests on brazed conduit should approximate that shown for close-joint conduit, with the a.c. impedance/d.c. resistance ratio approaching unity; this would be expected, as in neither case does the magnetic material form a closed ring round the conductor. It is true that few conduit manufacturers list a brazed conduit in heavy gauges, but it used to be available and could no doubt be again if present-day requirements demand. It would seem that this is an omission from a valuable document that should be rectified at an early opportunity; it may be found that the original authors' high opinion of brazed light-gauge conduit can be maintained today, but for very different reasons.

As the Report stands, however, and without the importation of any views of the writer's, it would seem that far from condemning close-joint conduit we should rather devise heavier gauges with this feature, to help us over this new impedance obstacle in installations made with steel conduits. After all, conduit is merely a mechanical protection for the conductors, and there is apparently no need to make it watertight all the while it is liable to produce its own brand of moisture through condensation; the open (?) seam could be closed by enamelling or galvanizing, little mechanical strength would be lost, although there might be some additional difficulty in threading. However, all these minor points fade into comparative insignificance compared with the necessity for reduction of the impedance factor, and at least we have some food for thought here.

Acknowledgments are tendered to The Institution of Electrical Engineers for permission to quote from the paper and discussion referred to, and to The Electrical Research Association for references to reports and the reproduction of the diagrams included.

MINES ELECTRICAL REPORT

ISSUED belatedly because the Inspectorate was heavily occupied with the preparation of the new Mines and Quarries Bill, the Annual Report of H.M. Chief Inspector of Mines for 1952, looks back briefly at a year in which there were only five fatal accidents at collieries due to electric shock, one of them at the surface. There were in the same year 65 non-fatal accidents causing injury to 75 persons, and 24 dangerous occurrencies.

Details of the fatal electrical accidents are given in the report. They illustrate the dangers of working on gear without checking that it is dead, and of defeating interlocks to facilitate fault-tracing.

One other fatal accident, not included in the five, merits special attention. A road layer was instantly killed by a blow from a falling armoured cable. Some repairers had lowered a length of the cable from the roof at a point 570 yds away when it suddenly commenced to tear through the hangers and fell to the floor for a distance of 790 yds. The road was 9 ft high and the cable was supported at intervals of 3 ft. Moving a cable calls for careful work and should only be undertaken under competent supervision. The ends of the length to be lowered should have been specially supported and it is good policy to leave loops of slack at intervals to reduce the effects of lash developing if several slings happen to get broken as the result of an accident. This accident is not common but it recurs at more or less regular intervals.

Problems of the Sealed Transformer

Discrepancies Between Theory and Practice Analysed at I.E.E.

THE hermetically sealed transformer possesses several advantages, particularly in maintaining a higher degree of oil preservation than is provided by the well-known oil conservator. As is well known the exposure of transformer oil to the atmosphere causes oxidation at the normal operating temperatures, and this in turn leads to the formation of acid and sludge. The essence of the sealed transformer is to isolate the oil from the atmosphere.

Several constructional attacks have been made. These were described in Mr E. B. Franklin's I.E.E. Supply Section paper "Sealed Transformers" presented last week. They could be summarised as (*a*) the use of metal bellows capable of expanding and containing the oil under all conditions of load; this method was confined to small transformers. (*b*) The use of Neoprene reservoirs filled with nitrogen and attached to the top of the expansion vessels. (*c*) The use of a space left above the oil and maintained full of nitrogen at a positive pressure of about 0·5 lb/sq in. derived via reducing valves from a high pressure source, and (*d*) the use of an expansion vessel or space large enough to limit the internal pressure on load, and attached to a transformer of otherwise normal construction; this expansion vessel or space might initially be filled with air or nitfogen. It was this latter type to which the paper was mainly devoted.

Discrepancies

Experiment had shown that the pressures occurring in sealed transformers did not agree with those as calculated from simple relations of volume and temperature, and it was concluded that the discrepancy was due partly to the gas in the expansion space going into solution and partly to the disappearance of some of the gas by chemical reaction with the oil. If it were possible to calculate gas pressure with reasonable accuracy it would be industrially important as leading to more rational design.

The rate of diffusion of gas into oil could be fairly rapid, but the release of gas from the oil was slow or negligible. Thus after an expansion and contraction cycle the pressure became less than its original value. The author derived a formula whereby this second pressure could be calculated. Assuming that the original gas contained oxygen, a chemical reaction could occur resulting in the loss of the oxygen from the occluded air. The author gave a further formula for estimating the pressure loss due to this cause.

One of the theories of electrical breakdown of transformer oils assumed that the presence of gas in suspension was responsible for the initiation of breakdown. It was therefore also reasonable to suppose that as pressure affected the availability of the gas in suspended form, breakdown strength varied with pressure, and a curve was given in the paper to show this.

The "clean up" of residual gas was liable in some cases to lead to large negative pressures when the transformer cooled down, and this was often undesirable. These pressures could be reduced by sealing the transformer under pressure, or by pressure limiting valves; alternatively, after filling and before sealing, air or gas could be used to replace the air removed during or before the filling process, nitrogen being the best gas for this purpose.

When designing the tank, it should be remembered that the duty involved in withstanding repeated pressure variations was more severe than in a normal breather-type tank, which might be called upon to withstand vacuum only a few times (in the filling process) during its working life.

DISCUSSION

MR L. H. WELCH (L.E.B.) raised the question of whether it was necessary to attain a higher degree of oil preservation than was provided by the well-known oil conservator. For large transformers he was satisfied to rely on a conservator and a good oil. For smaller transformers they had about 1,000 of the sealed type described as (*a*) by the author, completely filled with oil and with a device allowing expansion of the oil to take place. These had given no trouble with acidity or anything of that kind. They had also had 250 of type (*d*), the type with contained air above it, and these had all been scrapped, having proved unsatisfactory owing to the existence of negative pressure.

MR L. C. RICHARDS (Metro-Vick) suggested that the greatest danger with a sealed transformer of the (*d*) type arose from restricted breathing, which was almost certain to start acidity in the oil and corrosion of the tank covers.

MR C. N. THOMPSON (Shell Research) assumed that the principal object of sealed transformers was to minimise oil deterioration, and observed that research work which they had done showed that under conditions of limited oxygen access a given oil would tend to produce acidity to a greater extent than when the transformer was ventilated. There was also evidence that other electrical qualities, such as d.c. resistivity and power factor, might be impaired under reduced oxygen access conditions. The author's conclusion that there was too little oxygen in the system of the sealed transformer to cause oil deterioration might well be a dangerous generalisation.

MR A. T. CHADWICK (E.E.C.) said that following experience with a sealed 15 MVA transformer they had found that during extreme variations of atmospheric temperature it was possible to get a release of gas from the body of the oil sufficient to operate the Buchholz protection device.

DR J. B. HIGHAM (Birmingham University) emphasised the need for more research on the electric strength of transformer oil, a matter of great importance to the designer of sealed transformers, and on such subjects as oil-impregnated paper in contact with transformer oil.

MR L. SMITH (British Electric Transformer Co.) said that he had had experience over many years of the "cushion" type of arrangement for sealed transformers, where the case was pressure-tested to a high pressure before sealing, and he had yet to see a case where such a transformer was in other than first-class condition after a long period of service.

DR A. L. WILLIAMS (B.I.C. Cables) said he was puzzled by the fact that apparently transformer engineers still found it necessary to go on working on a problem which had been solved by cable engineers thirty years ago in the techniques used with oil-filled cable.

MR J. H. MASON (E.R.A.) questioned the author's assumption that the infinite-time breakdown value at normal frequency was 73% of the 1-minute breakdown value at twice that frequency and gave reasons for thinking, based on work on other materials, that there was no simple correlation between the two. He appealed to engineers to use impulse or d.c. proof tests instead of an a.c. proof test and to combine them with the use of discharge detecting equipment and meters to detect moisture in insulation.

MR T. WILLIAMS (Midlands E.B.) outlined the experience of the Midlands Board with sealed transformers, and said that they were still on the threshold of work which might provide some information on the basic problem of how the oil deteriorated and the usefulness of this transformer type.

The Author briefly replied to the points raised.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Profits—and State Industry

ALDERMAN Bennett's inspired rhetoric (ELECTRICAL TIMES, 13th January, 1955) on the above subject fails to mention the duty laid upon the industry by Section 1, Sub-section 6 (e) of the Electricity Act 1947 to promote the standardisation of systems of supply.

This cannot be done without vast capital expenditure, particularly in the London area, and this is the main reason why the problem which has been inherited by the nationalised industry is of such magnitude. It seems to be entirely within the spirit of the 1947 Act that reserve funds should be built up and used to provide capital for the purposes of standardisation and the benefits to all from its achievement are sufficient justification.

The great motor car manufacturers, to whom Alderman Bennett refers, would not dream of supplying vehicles operating on non-standard systems, e.g., front-wheel drive, fluid flywheel, etc., at the same tariff as their standard models. The supply industry attempts to do this and may reasonably expect to have a "cushion" of a reserve fund to furnish the extra capital and to equalise the costs of standardisation.

E. H. Jesty, A.M.I.E.E.,
BROMLEY, KENT.

Steels for Transformers

WE read with interest Mr Richardson's article in the 30th December issue on "Equipment for Export" and much appreciate the valuable advice which it gives to help British manufacturers in the export field.

There is, however, one important point on which Mr Richardson appears to be misinformed, namely, the availability of transformers with cores of low loss cold reduced steel from the U.K.

It is mainly within the last 2 years that good quality cold reduced steel has been produced in adequate quantity in this country and prior to this supplies were unobtainable from the U.S.A. for various reasons. Within the last 2 years however British manufacturers have been steadily developing the use of this material and many of them today can supply both standard and non-standard transformers with CRS cores and low losses in all ratings. At least one British manufacturer can supply CRS distribution transformers to the British Electricity T.1. Specification from stock.

R. M. Hobhill,
Transformer Sales Manager.
FERRANTI LTD., HOLLINWOOD.

Lower Voltages and Portable Tools

SOME time ago a letter in Readers' Views discussed the use of lower voltages with portable tools, and what voltage was required for safety. A recent experience leads me to agree that the supply should be no higher than 100 V whilst I think that portables themselves should have a covering of insulation or be made with insulated bodies and handles. The experience concerns a fault (which I had to rectify) on a 250 V, single phase portable grinder resulting in the operator sustaining a severe electric shock —probably a fault in a thousand, but it happened. The grinder had been sufficiently earthed via 3 pin plugs, etc., but when these tools are used in places where there is a likelihood of heavy sheets of steel being dropped on to the cables, who is safe?

In this particular instance a wagon had run over the cable feeding this grinder, cutting through the earth core but leaving the other two cores untouched. This had not been noticed and probably the grinder had been in service for some time in this condition before it developed a fault to frame while the workman was using it. Fortunately, he recovered from the resulting electric shock after a short time.

To try to reduce the chances of such accidents would it not be possible for owners of small works, garages and the like where portable tools are in frequent use, and a skilled electrician rarely employed, to be required to test the electrical installation and appliances periodically, say every three months. The small works owner would have to employ a competent engineer to carry out the test, which would not cost very much at these intervals. A record of each test would then be kept, and made available for inspection by a Factory Inspector. Where the safety of human life is concerned this expenditure would be worth it.

G. A. Leighton.
MORPETH. NORTHUMBERLAND.

Electric Floor Warming

I HAVE read with considerable interest the article on Electric Floor Warming that appeared in the 6th January issue of your Journal.

I cannot understand the reasoning put forward for the use of a cable duct of "D" cross section. In the article the assertion is made that with the use of "D" section ducting and expanded metal on top of the duct heat is directed mainly upwards and that the heat dissipation from the heating cable sideways and downwards is considerably lessened.

With an "off peak" floor heating system the design should be such that the whole floor is heated up in as short a time as possible consistent with safety immediately before the period of no electrical intake for heating purposes. The benefits of "D" section ducting, therefore, are not really necessary when using a system on "off peak" operation and galvanised screwed conduit would do equally as well at, I imagine, a considerable saving in cost.

One other point I am not clear on in the article, and that is have there been many failures of Panelec heating cables and is there any reason for not burying the cables solid in the floor slab especially when the installation is arranged for "off peak" operation?

Another point which I think should have been stressed in the article and that is the necessity for having an exceptionally good edge insulation around the perimeter of the ground floor slab as it is my experience that the losses from the insulated edges of floor slabs are very much greater than is commonly thought.

A. D. G. Isherwood,
BELFAST.

COLOUR PART THREE

In the concluding part of this article colour rendering and matching is discussed

By H. COTTON, M.B.E., D.Sc., M.I.E.E.
Emeritus Professor of Electrical Engineering in the University of Nottingham

IT was seen that the C.I.E. reference stimuli provided a means of specifying light in terms of chromaticity co-ordinates, facilitating the evaluation of light from sources, and mixtures of light from different sources. Moreover the lumen output of the source was shown to be equivalent to the summation giving the Y reference stimulus, a property which is utilised when considering the colour of surfaces. Before reflection is dealt with however, the colour rendering properties of a source must be discussed.

Colour Rendering

The colour appearance of a source is dependent only on the spectral energy distribution of its visible radiation, and from this distribution the x, y co-ordinates in the C.I.E. system can be determined. The colour of an illuminated surface is also uniquely dependent on the spectral energy distribution of the radiation reflected from it. If the surface is non-selective in that the proportion of reflected radiation at any wavelength λ is a constant throughout the visible range then the colour of the surface will be the same as the colour appearance of the source and will have the same x, y co-ordinates. A surface having the above property is a "white" surface, and probably the nearest approach to a perfect white is a metal surface "smoked" with magnesium oxide by being held in the fumes from burning magnesium.

The characteristic property of a perfect white surface is that its colour, when illuminated by any source whatever, will be characteristic of the radiation from the source, the act of reflection introducing no modification whatever. A coloured surface is one whose coefficient of reflection is not a constant throughout the visible range. Suppose, for example, that a surface reflected radiation of 5,461 Å only, then, if illuminated by a source of any colour appearance whatever, so long as the radiation included 5,461 Å, then the surface would appear spectral green of this particular wavelength. If the source contained no 5,461 Å in its radiant output, then the surface, being unable to reflect anything but 5,461 Å would have the same appearance as when not illuminated. In other words, it would have zero luminosity, and would appear black.

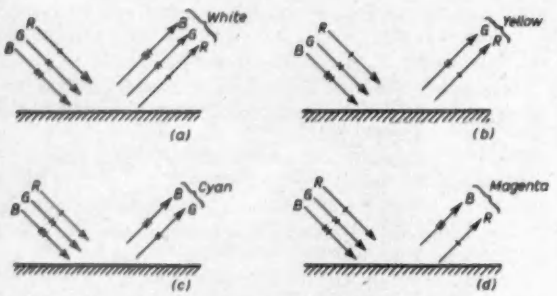


Fig. 13. Comparing the colour of light reflected from white and from coloured surfaces

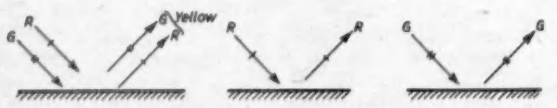


Fig. 14. The colour of light reflected from a "yellow" surface depends on the colour of the incident light

Practically realisable surfaces do not possess the property of selective reflection to such a marked degree since, (*a*) it is usual for the dominant colour of the surface to be the result of reflection over a wide spectral band, and (*b*) it is doubtful if there is any surface having a reflection factor of zero at any wavelength. Usually, coloured surfaces are illuminated by something approximating to white light, and the colour of the surface then depends on what is removed from the incident radiation by absorption. Fig. 13 shows four cases of surfaces illuminated by a mixture of

TABLE 7. COMPUTATION OF COLOUR CO-ORDINATES OF LIGHT REFLECTED FROM THE SAMPLE SURFACE WITH ILLUMINATED A AS SOURCE

λ	$P\lambda$	$P\lambda$	$P\lambda\,P\lambda$	$\bar{x}\lambda$	$\bar{y}\lambda$	$\bar{z}\lambda$	$P\lambda\,P\lambda\,\bar{x}\lambda$	$P\lambda\,P\lambda\,\bar{y}\lambda$	$P\lambda\,P\lambda\,\bar{z}\lambda$	$P\lambda\,\bar{y}\lambda$
4,000	14·71	0·074	0·1089	0·0143	0·0004	0·0679	0·0016	—	0·0074	0·0059
4,200	21·00	0·070	1·4700	0·1344	0·0040	0·6456	0·1976	0·0059	0·9490	0·0840
4,400	28·70	0·060	1·7220	0·3483	0·0230	1·7471	0·5998	0·0396	3·0085	0·6601
4,600	37·82	0·060	2·2572	0·2908	0·0600	1·6692	0·6564	0·1354	3·7677	2·2692
4,800	48·25	0·079	3·8118	0·0956	0·1390	0·8130	0·3651	0·5308	3·1047	6·7068
5,000	59·86	0·166	9·9368	0·0049	0·3230	0·2720	0·0487	3·2096	2·7028	19·3345
5,200	72·50	0·500	36·2500	0·0633	0·7100	0·0782	2·2946	25·7375	2·8348	51·4750
5,400	85·95	0·681	58·5320	0·2904	0·9540	0·0203	16·9977	55·8395	1·1882	81·9963
5,600	100·0	0·724	72·4000	0·5945	0·9950	0·0039	43·0418	72·0308	0·2824	99·5000
5,800	114·44	0·744	85·1434	0·9163	0·8700	0·0017	78·0169	74·0748	0·1447	99·5628
6,000	129·04	0·759	97·9414	1·0622	0·6310	0·0008	104·0334	61·8010	0·0784	81·4242
6,200	143·62	0·771	110·7310	0·8544	0·3180	0·0002	94·6086	35·2125	0·0221	45·6712
6,400	157·98	0·783	123·6983	0·4479	0·1750	—	55·4045	21·6472	—	27·6465
6,600	171·96	0·795	136·7082	0·1649	0·0610	—	22·5432	8·3392	—	10·4896
6,800	185·43	0·803	148·5791	0·0468	0·0170	—	6·9535	2·5258	—	3·1523
7,000	198·26	0·811	160·7889	0·0144	0·0041	—	2·3154	0·6592	—	0·8129
						Sums	428·0788	316·7888	18·0907	530·7913

R, G, and B in such proportions as to give white. In Fig. 13 (a) all three are reflected equally and the surface appears white *under that particular illumination.* In 13 (b) the blue is absorbed and only the red and green reflected, with the result that the surface will appear yellow. In 13 (c) the red is absorbed, the colour of the surfaces thus being blue-green, or cyan. In 13 (d) the green is absorbed, and the colour of the surface is thus magenta.

Now consider the surface B again, and let the incident light be modified by the suppression of one or more of its components. If the incident light consists of the two components R and G, Fig. 14, then the reflected light will contain them and the colour of the surface will again be yellow as in Fig. 13 (d). If the incident light has red only, then, since this is reflected, the surface will appear red, Fig. 14. If the incident light has green only, then,

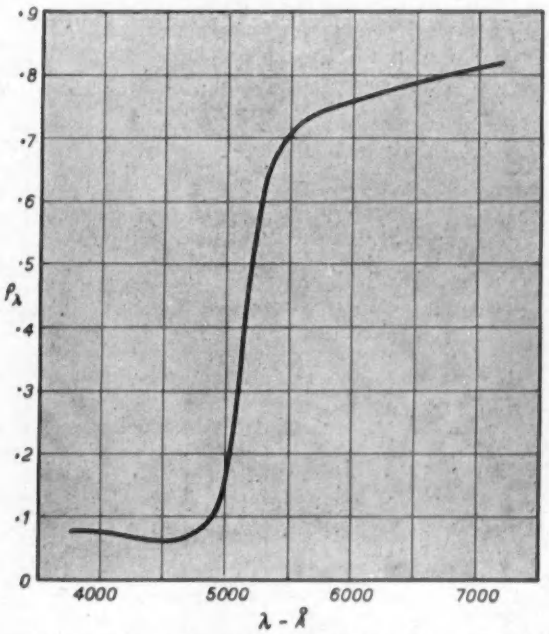


Fig. 15. Spectral reflectance of the surface considered in the numerical example on this page

since this also is reflected, the surface will appear to be green, Fig. 14. We thus have the very important result that the colour of a coloured surface is not a property of the surface only, but that it also depends on the spectral composition of the incident light. Thus the yellow surface of the above example appears yellow in white light, yellow in yellow, red in red and green in green. This is the explanation of the changing appearance of a coloured fabric when viewed under different illuminants, and of the tendency of the housewife to do her colour matching at the door of the shop instead of under the interior lighting.

In order that the value of the luminance of a surface, as a fraction of that of a perfectly white diffusing surface under identical illumination, can be assessed, the tristimulus values are adjusted so that the co-ordinate of Y is unity for the perfectly white surface. The co-ordinate of Y for the sample surface then gives the luminance value required. Let the spectral reflectance factor of the surface be ρ_λ while that of the perfectly white differing surface is unity, then we have for the co-ordinates of the X, Y and Z stimuli of the reflected light.

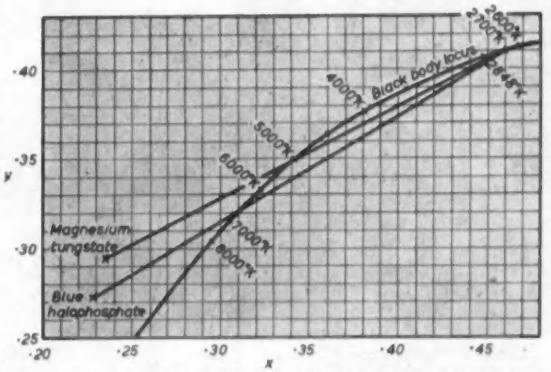


Fig. 16. A part of the C.I.E. chromaticity diagram of the full radiator locus showing mixtures of two blue fluorescent and incandescent lamps (by courtesy of the Illuminating Engineering Society)

$$u = \int \rho_\lambda P_\lambda \bar{x}_\lambda \, d\lambda \Big/ \int P_\lambda \bar{x}_\lambda \, d\lambda$$

$$v = \int \rho_\lambda P_\lambda \bar{y}_\lambda \, d\lambda \Big/ \int P_\lambda \bar{y}_\lambda \, d\lambda$$

$$w = \int \rho_\lambda P_\lambda \bar{z}_\lambda \, d\lambda \Big/ \int P_\lambda \bar{z}_\lambda \, d\lambda$$

Example. A surface has a spectral reflectance factor according to the graph of Fig. 15. If it is illuminated by a source having the spectral distribution of Illuminant A, calculate (*a*) the co-ordinates of its resulting colour, (*b*) its luminance as a fraction of that of a perfectly white diffusing surface illuminated in exactly the same manner.

Values of P_λ for illuminant A are available from tables; values of ρ_λ are determined from the graph of spectral reflectance factor for the surface. The computation is conveniently made in tabular form as shown in Table 7.

u = 428·0788 / 530·7913 = 0·8065
v = 316·7888 / 530·7913 = 0·5968
w = 18·0907 / 530·7913 = 0·0341
u + v + w = 1·4374
x = 0·8065 / 1·4374 = 0·5611
y = 0·5968 / 1·4374 = 0·4152

Now suppose that the same surface is illuminated by an illuminant C, then we tabulate as before (Table 8) except that we start with the modified value for P_λ

u = 313·4101 / 527·1519 = 0·5945
v = 328·1961 / 527·1519 = 0·6226
w = 48·2979 / 527·1519 = 0·0916
u + v + w = 1·3087
x = 0·5945 / 1·3087 = 0·4306
y = 0·6226 / 1·3087 = 0·4509

The points for the two kinds of illumination are indicated at Y_A and Y_C in Fig. 8 (Pt. 2). Both represent unsaturated colours and their positions relative to the wavelength graduations or the spectral colours show that with illuminant A the colour will be a yellow red, whereas the same surface under illuminant C will be yellow. By joining the points to the respective illuminants and producing to intersect the spectral locus, we obtain points giving the dominant hues relative to these illuminants. Thus, with illuminant A, the dominent wavelength is 5,910 Å, and this means that a monochromatic radiation of this wavelength mixed in the correct proportion with the radiation of illuminant A will, on illuminating a perfect white diffusing surface give the colour corresponding to the point Y_A. The dominant wavelength with respect to illuminant C is 5,755 Å. The important point to notice is the great change produced in the colour appearance of the surface by the change in illuminant.

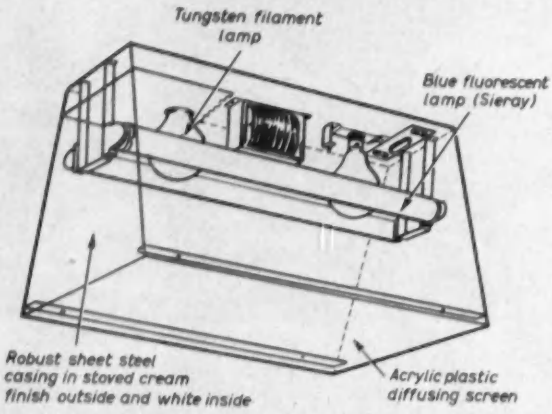

Tungsten filament lamp
Blue fluorescent lamp (Sieray)
Robust sheet steel casing in stoved cream finish outside and white inside
Acrylic plastic diffusing screen

Fig. 17. The industrial colour matching unit produced by Siemens Electric Lamps and Supplies Ltd. It has an output of 3,000 lumens

When illuminated by standard illuminant A the luminosity of the surface is 0·5968 of the luminosity of a perfect white diffusing surface illuminated in an identical manner. When illuminated by standard illuminant C, the ratio is 0·4152, the low value being due to the high proportion of the radiant output of illuminant C within the wavelength range 4,000 to 5,200 Å where ρ_λ is small.

Illuminants for Colour Matching

There are many fields in which colour judging is of extreme importance, two examples being the colour grading of raw materials of various kinds, and the assessment of the colours of the final products of the dyeing and colour printing industries. Some of this work is extremely critical and consequently a recognised illuminant for colour matching is essential. The requirement is a spectral composition approximating to that of north sky light. It is true that this can be achieved by the use of tungsten lamps used in conjunction with filters, but the filter reduces very appreciably the total lumen output and is therefore to be avoided if possible. The modern tendency is to use a combination of tungsten and mercury fluorescent lamps, the latter being of blue colour so as to compensate for the excess of red in output of the tungsten alone.

Fig. 16[4, 5, 6] shows a portion of the full radiator locus with the points for two blue fluorescent lamps, the phosphors being magnesium tungstate and calcium halophosphate respectively. If we take any colour temperature for the full radiator, 2,700° K in Fig. 16 and join this point to the points for the two phosphors we obtain straight lines which are the loci of all possible mixtures of the full radiator (and therefore of a tungsten lamp at a colour temperature of 2,700°K), and each of the two fluorescent lamps. Over a wide range these two lines follow the full radiator locus fairly closely, particularly the magnesium tungstate. Hence any full radiator colour within the appropriate range (about 2,700 to 5,500°K in the case of the magnesium tungstate) can be simulated fairly closely. If the holophosphate fluorescent lamp is used there is close agreement in the neighbourhood of 7,000°K showing that the equal energy white can be simulated. The Siemens Industrial Colour Matching Unit constructed on these principles is illustrated in Fig. 17 which is self-explanatory. It contains two 60 W pearl gas-filled tungsten filament lamps and two 2 ft blue fluorescent lamps. With the holophosphate lamps, the output is 3,000 lumens for an overall intake of 220 W, and the illumination on a working plane 3 ft below the unit 45 lu/sq ft.

There are two limitations to this type of unit—(*a*) the spectral distribution of the unit may vary with time, partly by actual changes in the colour of the component lamps, and partly by a change in proportion due to different degrees of ageing, and (*b*) any mercury fluorescent lamp exhibits pronounced peaks at the wavelengths of 4,047, 4,358, 5,461 and 5,981 Å. With a patterned fabric having one or more of these there may be selective reflectance resulting in a high luminance of certain areas.

Transmission

When light is transmitted by a transparent medium there will always be a certain amount of absorption, the flux of the emergent beam therefore being less than that of the incident beam. The emergent flux expressed as a percentage of the incident flux is called the transmission factor T, and the reciprocal of T therefore gives a measure of the amount of absorption. It is usual to define the density as the logarithm of T. The value of T for any particular

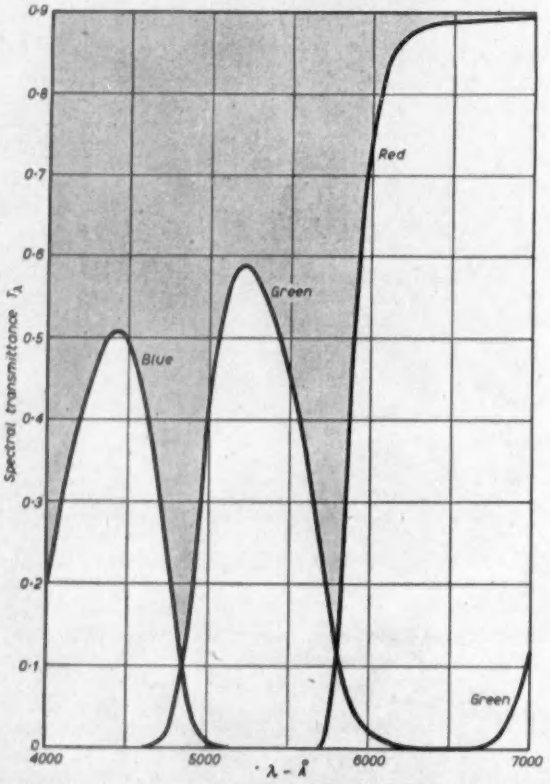


Fig. 18. Spectral transmittances of tricolour red, green and blue filters

homogeneous medium is dependent on the thickness x, and we have the law $T=e^{-ax}$
where a is a constant for a given medium

$$\therefore D=\log T=-ax \log e=bx \text{ (say)}$$

Hence when D=1, x=1/b. This value of the reciprocal of the thickness which makes the density equal to unity is called the extinction coefficient. If two or more filters are superposed, then the transmission factor of the combination is $T=T_1T_2$, or, the density of the combination is $D=D_1+D_2$.

Colour will be modified by transmission provided the value of T, and therefore of D, is a function of the wavelength. Such a medium is called a colour filter, and the use of such filters offers a very convenient means of obtaining coloured light. Suppose, for example, that a filter has T_λ equal to zero over a wide range from, say, blue green to violet, but that T_λ is unity (or constant) for the remain-

der of the spectrum. If light from a source composed of real red, green and blue stimuli is transmitted by the filter then the blue will be absorbed and the emergent light will be a combination of the red and green, namely yellow.

If we replace $\rho\lambda$ by $T\lambda$ in the equations for reflected light we have those for transmitted light, namely:

$$u = \int P_\lambda T_\lambda \bar{x}_\lambda \, d\lambda \Big/ \int P_\lambda \bar{x}_\lambda \, d\lambda$$

$$v = \int P_\lambda T_\lambda \bar{y}_\lambda \, d\lambda \Big/ \int P_\lambda \bar{y}_\lambda \, d\lambda$$

$$w = \int P_\lambda T_\lambda \bar{z}_\lambda \, d\lambda \Big/ \int P_\lambda \bar{z}_\lambda \, d\lambda$$

and the procedure in determining the co-ordinates of the emergent light is exactly the same as that for the co-ordinates of the light reflected from a coloured surface.

The spectral transmission factors for three typical filters, the Ilford Tricolour Red, Green and Blue respectively, are given in the form of graphs in Fig. 18 and when the incident light is from an illuminant A, the co-ordinates of the transmitted light are

Red	x=0·6680	y=0·3317
Green	x=0·2713	y=0·6633
Blue	x=0·1480	y=0·0337

The points for the red and the blue are very close to the locus for spectral colours; that for the green is not so close, undoubtedly because the small amount of red between 6,750 and 7,000 Å produces some desaturation.

When filters are used in measuring instruments it may be necessary to calculate the loss of light, and this will include not only absorption, but reflection from the surfaces. With polished glass surfaces it is general to use the Fresnel formula for the percentage reflection loss, which is

$$R = [(n-1)/(n+1)]^2$$

Thus for a refractive index n=1·51, we have

$$R = (0{\cdot}51/2{\cdot}51)^2 = 0{\cdot}0413 \text{ or } 4{\cdot}13\%$$

for one surface and therefore 8·26 for two.

Colour by Subtraction

In Fig. 3 (page 845, 9th December issue) the process of colour production by addition is demonstrated. There are three separate sources each provided with one filter so that the possible combinations are: three colours due to each source alone; three colours due to the source taken in pairs; one colour due to all three sources together, this being white if the amounts of the separate components are in the correct proportion. Now suppose that there is only one source and that there are three filters of colour (in conjunction with this particular source) corresponding to the additive mixtures of the previous red, green and blue taken in pairs. These mixtures are:

Red + Green = Yellow
Green + Blue = Cyan
Blue + Red = Magenta

These filters alone will give yellow, cyan and magenta respectively. Let them be used in pairs, then we have—(*a*) *Yellow and cyan together.* The yellow transmits red and green but the cyan only transmits green, so that the resultant will be the primary green used for the additive mixtures. (*b*) *Cyan and magenta together.* The common component in the additive mixture is blue and therefore the combination will transmit to primary blue. (*c*) *Magenta and yellow together.* By the same reasoning the combination will transmit the primary red. (*d*) *All three filters together.* There is no component colour common to all three and consequently no light will be transmitted. These changes are represented diagrammatically in Fig. 19. The above colours are generally denoted as follows: Yellow—minus blue; cyan—minus red; magenta—minus green; the reason being that yellow and blue are complementary since yellow is white minus blue: similarly with the others. Colour matching can be carried out by the subtractive process but it is no longer a mixture of two or three stimuli. It is essential that the transmission curves for the three filters should overlap somewhat otherwise black will not be realisable. The filters whose curves are given in Fig. 18 are suitable.

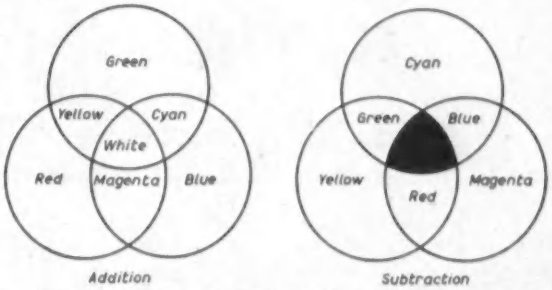


Fig. 19. This diagram compares the additive and subtractive methods of producing colour

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6. Dipl. Ing. J. Hoffman: "A Colour Matching Unit," Light and Lighting, October 1953, page 391.

TABLE 8. COMPUTATION OF THE COLOUR CO-ORDINATES OF THE LIGHT REFLECTED FROM THE SAMPLE SURFACE BUT WITH ILLUMINANT C AS SOURCE

λ	$P\lambda$	$\rho\lambda$	$\rho\lambda P\lambda$	$\bar{x}\lambda$	$\bar{y}\lambda$	$\bar{z}\lambda$	$\rho\lambda P\lambda \bar{x}\lambda$	$\rho\lambda P\lambda \bar{y}\lambda$	$\rho\lambda P\lambda \bar{z}\lambda$	$P\lambda \bar{y}\lambda$
4,000	63·30	0·074	4·6842	0·0143	0·0004	0·0679	0·0670	0·0031	0·3181	0·0025
4,200	98·10	0·070	6·8670	0·1344	0·0040	0·6456	0·9095	0·0271	4·3688	0·3924
4,400	121·50	0·060	7·2900	0·3483	0·0230	1·7471	2·5391	0·1677	12·7364	2·7945
4,600	123·10	0·060	7·3860	0·2908	0·0600	1·6692	2·1478	0·4432	12·3287	7·3860
4,800	123·90	0·079	9·7881	0·0956	0·1390	0·8130	0·9357	1·3605	7·9577	17·2221
5,000	112·10	0·166	18·6086	0·0049	0·3230	0·2720	0·0912	6·0106	5·0615	36·2083
5,200	96·90	0·500	48·4500	0·0633	0·7100	0·0782	3·0669	34·3995	3·7989	68·7990
5,400	102·10	0·681	69·5301	0·2904	0·9540	0·0203	20·1915	66·3317	1·4115	97·4034
5,600	105·30	0·724	76·2372	0·5945	0·9950	0·0039	45·3230	75·8560	0·2973	104·7735
5,800	97·80	0·744	72·7632	0·9163	0·8700	0·0017	66·6729	63·3040	0·0124	85·0860
6,000	89·70	0·759	68·0823	1·0622	0·6310	0·0008	72·3170	42·9600	0·0054	56·6007
6,200	88·10	0·771	61·7571	0·8544	0·3180	0·0002	52·7653	19·6388	0·0012	28·0158
6,400	87·80	0·783	68·7474	0·4479	0·1750	—	30·7920	12·0308	—	15·3650
6,600	87·90	0·795	69·8805	0·1649	0·0610	—	11·5233	4·2627	—	5·3619
6,800	84·00	0·803	67·4520	0·0468	0·0170	—	3·1568	1·1467	—	1·4280
7,000	76·30	0·811	61·8793	0·0144	0·0041	—	0·8911	0·2537	—	0·3128
						Sums	313·4101	328·1961	48·2979	527·1519

around the trade

by Peregrin

THERE are murmurings just now in the Trade, and not for the first time, about the poor service facilities behind many popular and well-advertised appliances. When a consumer buys a brand-new appliance of renowned make, through the usual retail channels, he buys implied service with it. He may never need that service but he is entitled to assume that the resources of the manufacturer and retailer are there to support the article if it fails during a reasonable working life. That has been well understood in other trades, especially the motor car trade, for many years, but the electrical customer is not so fortunate. When an appliance, even a newly bought one, gives trouble, the poor owner often finds himself bandied about between the retailer and the maker. The former makes some effort, when he can find time, but thinks that the manufacturer should take his share, while the latter is apt to express pained surprise and hint that had the article been properly used this would not have happened. So the customer is left without the use of his appliance, and probably begins to view E.D.A. advertisements with a critical eye.

The most disturbing feature about this however is the lack of spares for replacements. It is bad enough to obtain spare parts for current models. At the moment I have been waiting several weeks for a trifling fitment for a not very old cooker which cost £40, and the makers are much less concerned about the delay than I am. But when the replacement is for an old or obsolete model the situation is much more acute.

The motor car trade is blessed with firms who exist only for the supply of spare parts. They buy what spares they can and make those they can't, and the older the car the more enthusiastic they become. They take a pride in being able to offer any spare for any car, and usually out of stock. Some day the electrical trade may be similarly blessed, and such an enterprise is long overdue. It would be swamped with orders for years to come. Meanwhile there are several good firms who specialise in replacement elements and such essential spares. All praise to them. They give a valuable service and seldom admit defeat, but even they often have to depend on the makers. There is room for a comprehensive, all-embracing electrical spare parts organisation, and it would be a boon to all concerned, not least the manufacturers who, one cannot help feeling, would be glad to be rid of this tiresome service business.

Fire Regulations

It is very satisfactory to note that the regulation demanding guards for electric fires is being taken seriously. At the time of its enaction many electrical cynics viewed it as a nine days' wonder, just another restriction announced with much applause and soon to be forgotten. Fortunately they were wrong, for the public, as well as the dealers, are becoming mindful of this safety requirement. So much so that retailers often have to display considerable tact or ingenuity when confronted with an antique fire which is not safe in any case, guard or no guard.

One large Midland town, and doubtless others, is starting quite a campaign of inspection under the new Act, but it is found that the first job is to put its own house in order. Thousands of Corporation houses have built-in electric fires as part of the house, and it will be a hard and lengthy task to "persuade" the tenants to fit suitable guards at their own expense. There seems no adequate reason why the ratepayers should have to provide the guards, for private house-owners in a similar position are not obliged to do so.

There has already been a prosecution against retailers for offering unguarded fires for sale. I am surprised at that, for I see the windows and showrooms of a great many retailers, and I never see any examples of the offence. Surely, this is one of the few regulations which will eventually be to the good of all concerned—the user, the manufacturer, the wholesaler and the retailer. Also, let us hope it will ease the work of coroners and hospitals.

Electrical retailers, especially those who are contractors, are inclined to take a gloomy view of the prospect of fifty years of National Service. Good juvenile labour has been scarce ever since the war, because of full employment everywhere and because the lads are easily attracted to more remunerative, if less interesting, trades. This tendency is very noticeable in the large industrial centres where there is unlimited choice of occupation for youths.

But the problem only begins there. When a contractor manages to capture a likely lad, gives him every facility for practical training and technical education, and hopes to keep him for life, the age of 18 approaches at terrific speed, and off goes the new boy, just as he is becoming a useful member of the firm. It would be a comfort to feel that after all two years soon pass, and then the lad will return, better in health and outlook, impatient to resume where he left off, but that is not quite the picture. It is a dismal fact that many of the youths are reluctant to return to electrical work. Service life, and increased age, changes their attitude to life. They come back with different ideas, and usually they have forgotten much of what they were taught before they went away. Many wish to make a complete change. Others return to their old job just to please a good boss, but they are not the same lads who left two years before, and it is only a matter of time before they drift away.

If a youth is apprenticed the decision has to be faced whether to go at the age of 18, or apply for deferment. There is a natural tendency to put off the evil day, but many employers, at inconvenience to themselves, urge the apprentices to do their Service at the normal age, deeming those two years less important and less expensive than those between 21 and 23. At that age a youth leaves the Service a grown man, very likely married. Not only are his immediate prospects more important to him, but he finds it much more difficult to start normal life again. There is a lot to be said for "getting it over" at 18.

Designing for Appearance

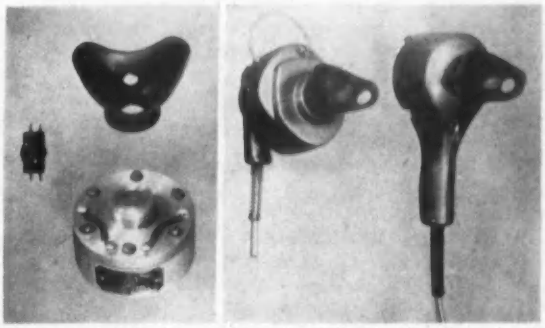
B.T.H. STARTS NEW COURSE FOR SENIOR APPRENTICES

By B. T. J. BROWN,* A.M.I.E.E.

DESIGN engineers in Britain are becoming increasingly aware that the appearance of the equipment they design has an important bearing on its sales, both in the home and export markets. There is also a growing awareness of the need for men with specialised training in both engineering and æsthetic design to guide design engineers in the appearance of their products. It is important that these industrial designers should be in a position to discuss engineering problems intelligently with experts and in order to do this they need a sound engineering training. For this reason, it is easier to start with the technically trained man and train him for industrial design than to take the art student and expect him to attain the required engineering standard at so late a stage in his career. There is also a growing need for the creation of appearance design consciousness among the younger generation of the engineering industry to ensure that the young engineer is alive to art and appreciative of good appearance, alongside good functional design.

Practical Course

In an endeavour to meet these needs The British Thomson-Houston Co., Ltd., has recently introduced at Rugby a course on Appearance Design for senior apprentices in both the drawing office and engineering design groups. The course which is believed to be the first of its kind in the electrical industry enables students who show the required flair and ability to be given further training of a specialised nature to fit them later as industrial designers. It also provides for the creation of interest in appearance design, so necessary in the engineering industry today. The instruction which is part of the final period of drawing office training is spread over a three months' period and consists of lectures, discussions, sketching and practical design for good appearance.



Left are the functional parts of an industrial hand microphone given to the apprentice together with instructions. Right are the three dimensional wooden models made from the best designs

The following series of illustrated lectures are given during the first part of the course: "An Introduction to Appearance Design," "The Appearance Designer in Industry," "A brief History of Appearance Design—1850 to Present Day," "Appearance Design within the A.E.I. Group of Companies."

These lectures which cover the history, the present trend and the application of this trend to engineering products are followed by group discussion. Each group decides on its own questions under the control of a group leader, visual aids in the form of photographs, design quiz sheets and actual models being used to stimulate discussion.

Sketching and lettering are both part of the practical training which also covers proportion, form, shading, colour and design. Each apprentice completes an Appearance Design Course Book, which contains lecture notes,

The training drawing office for apprentices at the British Thomson-Houston Co., Ltd., Rugby

*Mr. Brown is Co-ordinator of Training within the B.T.H. Engineering Drawing Offices, Rugby.

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sketching, lettering and cut-out illustrations from magazines, usually "adverts," which have good appearance. Other instructional facilities are given in the form of films, display and the circulation of the magazine "Design." A permanent display stand which is often the centre of discussion, exhibits many of the Company's products of approved design.

During the second half of the course each apprentice attempts a practical design incorporating his own ideas on appearance. The instructions given, ask for a pictorial sketch showing the appearance design, a dimensioned outline and a general arrangement showing the engineering design. A typical product that has been used for this purpose is an industrial hand microphone as illustrated.

On completion of all the designs a panel consisting of an industrial designer consultant, a design engineer, a chief draughtsman and a sales representative adjudicate and criticise the apprentice's efforts. Three dimensional models are then made of the best designs and these are exhibited on the display stand.

We envisage such a course creating "appearance design mindedness" in the drawing office and bringing out a number of "engineering appearance designers" thus endeavouring to fulfil the need in industry today, of engineers and draughtsmen whose designs have a fine and lasting appearance.

ELECTRICAL WHOLESALING IN 1950

ELECTRICAL wholesaling organisations handled just over 10% of the total value of wholesale trading carried out in this country in 1950. This is the immediate fact to be learnt from the third volume* of the Census of Distribution, 1950, published today by H.M.S.O. which, in a little over 200 pages, presents an exhaustive statistical analysis of the British wholesaling industry.

Taken as a whole, the volume of wholesale trading in this country is immense—totalling, in 1950, £13,049 millions—and the electrical contribution stood then at the by no means inconsiderable figure of £133 millions. This figure represents the total sales of that year; receipts by electrical wholesalers amounted to £127 millions. The electrical trade was distributed among 1,282 wholesaling establishments (2·3% of the total of 55,701), employing 23,648 persons, and paying £8,826,000 in salaries and wages during the year. A more detailed analysis of the electrical wholesaling industry is shown in the accompanying table.

Broadly, the census report is divided into two distinct parts, due to the method of obtaining information. In general, separate data were obtained from each establishment, but those undertakings having more than one establishment were allowed to furnish information in respect of the organisation as a whole. Some 92% of the total number of wholesale establishments on the register are represented in the census, this total including wholesaling departments of manufacturing organisations. There were 163 such establishments in the electrical industry, handling £49,079,000 work of goods. The distribution of establishments throughout the country is given, for standard areas, certain conurbations and selected towns. As might be expected, this breakdown shows that the greatest volume of electrical wholesaling is carried out in the Greater London area. Its 367 establishments handle sales to the value of £69,294,000, just over half the total. Next in order of volume is the North Western area, where a trade of £15,488,000 is carried out by 194 establishments.

A certain number of the 1,282 establishments are, however, grouped in wholesaling organisations, the total of such electrical organisations being 874. Figures for these organisations are difficult of comparison since all these organisations do not appear to have submitted information under the separate headings. For example, the total sales invoiced amounts to £127,249,000 (as against total sales of £132,678,000) but only 844 organisations reported. For sales invoiced to buyers in the U.K., it is seen, however, that 221 organisations reported sales to the public of £1,056,000; 641 to retailers, £47·9m; 245 to wholesalers, £18·93m; 552 to industrial users and government, £44·95m; and 42 to crown agents and purchasing branches of overseas firms, £1·06m. Of sales invoiced to buyers abroad, 162 organisations reported exports and re-exports of £13·18m; 9, transhipments and external trade of £98,000.

In the summary of trading figures, it is interesting to note that 655 wholesalers with stocks, having receipts of £72,156,000 experienced a stockturn of 6·8 as against 11·3 for the total for all wholesalers with stocks. The cost of goods sold was 82·1% of receipts, wages and salaries 7·3% and cost of transport 1·5%, leaving a net margin of 9·1% for other outgoing expenses. It must, of course, be remembered that, in 1950, the presence of purchase tax and similar factors imposed restrictions on electrical trading.

*Census of Distribution and other Services, Vol. III: Wholesale Trades, H.M.S.O. 15s.

BRITISH ELECTRICAL WHOLESALING IN 1950

Kind of business	Establishments	Receipts £'000	Sales £'000	Persons engaged in week ending June 24, 1950					Wages and Salaries (year) £'000	Bonuses etc. (inc. in wages and sals. for yr.) £'000
				Total	Working proprietors		Paid employees			
					Total	Full-time only	Total	Full-time only		
Electrical machinery, equipment	101	6,081	6,393	1,611	69	55	1,542	1,499	668	51
Electrical wires, cables, conduits	107	4,757	5,809	889	70	58	819	762	338	32
Electrical supplies, appliances ...	501	56,294	57,184	10,546	277	201	10,269	9,869	3,887	317
Electrical supplies, appliances*...	116	12,890	12,879	2,639	61	50	2,578	2,531	972	80
Radio and Television	125	21,466	21,245	3,562	92	61	3,470	3,308	1,316	55
Batteries**	32	1,033	1,011	238	25	15	213	198	83	5
General	332	25,786	29,168	4,401	160	130	4,241	4,020	1,645	152
Total—electrical goods ...	1,282	127,274	132,678	23,648	729	555	22,919	21,989	8,826	687
Total—all wholesalers ...	55,701	9,416,474	13,049,208	790,266	43,207	35,232	747,059	707,197	297,666	32,621

*Organisations dealing in supplies and appliances and also having at least 20% of trade in radio and television. Supplies and appliances include lighting fittings, wiring accessories, domestic appliances and other electrical goods.

**Organisations included under "Radio, Television" but having 80% or more of sales of goods under this specialist heading.

MR T. B. D. TERRONI

Communications through the Ages

THE HISTORY OF INFORMATION TRANSFER DESCRIBED AT FARADAY LECTURE

THIS year's Faraday Lecture, presented last Thursday (Jan. 27) by Mr T. B. D. Terroni, served to emphasise the vital importance of communication to the development of civilisation. As usual, the Central Hall was almost embarrassingly full, and as has now become traditional, the ingenuity of the demonstrations served to hold and retain the interest of the audience.

The lecture began, after a few introductory remarks on the importance of communications, by presenting a short cartoon film in colour which traced the development of information communication from the early times when tablets inscribed with hieroglyphics were carried manually by the Egyptians, through the beacons established as a warning system over the countryside, the visual telegraph, the telephone, and to the modern automatic telephone exchange. A demonstration of the equipment used in automatic working was provided by showing the operation of a 2-motion selector with 100 outlets, each of which lit up a bulb on a demonstration panel containing 100 bulbs.

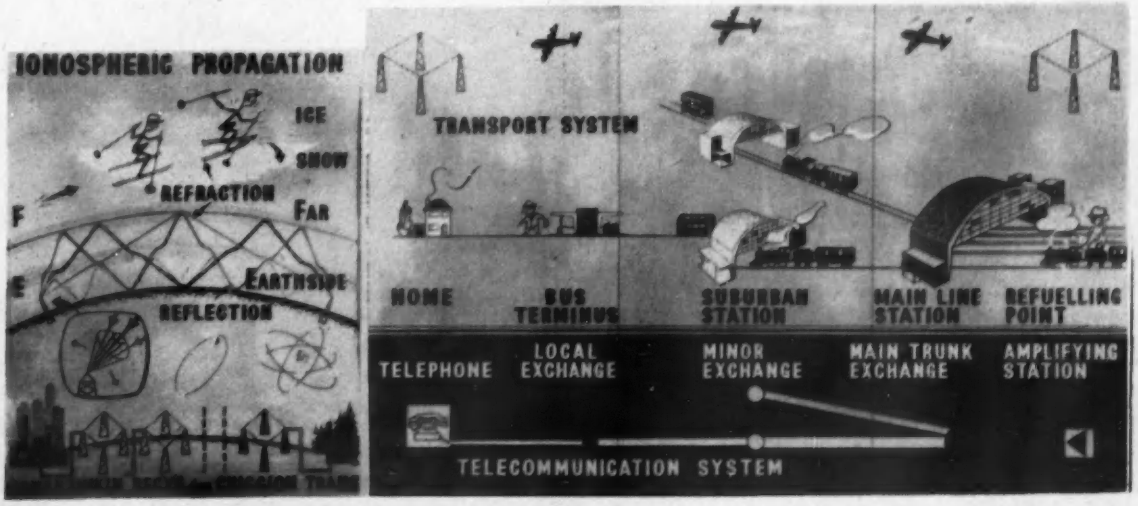
Memory storage was also demonstrated by the use of a magnetic drum, into which dialled numbers could be fed, and read out again at a later period of time. Routing systems were also shown, and here analogies between transport systems were called into play to show the similarity between local, main line (or trunk) services and junctions within the railway and the telecommunication fields.

An ingenious method of demonstrating the simultaneous transmission of dissimilar messages, utilising a single medium was provided by a recording in which a high-pitched female and a low-pitched male voice were heard simultaneously. Here discrimination was provided by the difference in average pitch. An electro-mechanical analogy was also provided. Here three conversations were represented by white balls, which could be changed by ultra-violet irradiation into one of three colours. This change in colour was representative of modulation. The three "conversations" then travelled down a glass tube at the end of which, photo-electric cells operating through appropriate light filters sorted out the conversations into the three desired channels, thus illustrating the process of demodulation. The extension of the technique of using carrier systems to provide multichannel working was then described in more detail.

Consideration was next given to the developments which have taken place in circuits from cables up to h.f. waveguides. This was followed by an explanation of propagation through the ionosphere by radio waves accompanied by specially prepared coloured drawings to show easily understood analogies between the processes involved. A radio demonstration showed the directivity of very short waves and the fading effects which were experienced in the ionosphere.

Finally the lecture ended with the showing of a documentory film which traced the establishment of a telephone call from Birmingham to New York, giving a detailed picture of the setting up of the call and the route taken by the signals through exchange buildings, apparatus rooms, radio stations and so on, and at the same time it gave a good impression of the magnitude of the task involved in establishing a network of communications in this country.

Ionospheric propagation as depicted in the Faraday Lecture, and right, analogy between rail and communication systems



Progress in 1954

Technical interest in output and orders of some leading electrical manufacturers

THE British Thomson-Houston Co. reports once again a steady demand both from home and overseas sources for electrical plant of every description, resulting in full-capacity working at all factories. So great, however, is the anticipated requirement, that the ten year expansion plan to treble the output of turbo-alternator and associated equipment is now well under way. The pilot blading plant in Larne has been training personnel throughout the year for the new factory which is expected to begin production early this year, and work has now begun on the new main factory in the same area.

Power Generation

Readers have been able to follow the progress of plant installation in this country from the monthly reports of "Power Supply" which we publish; abroad, however, several notable sets have been put into service. At Nairobi South, the first of the two 2,500 kW gas turbines is now operating, while on the continent of Europe, two machines, built by Messrs Werkspoor to BTH design were commissioned. These are both single cylinder machines, one having an output of 30 MW and the other 36 MW, the latter being designed to supply bled steam for district heating when running at a maximum electrical load of 30 MW.

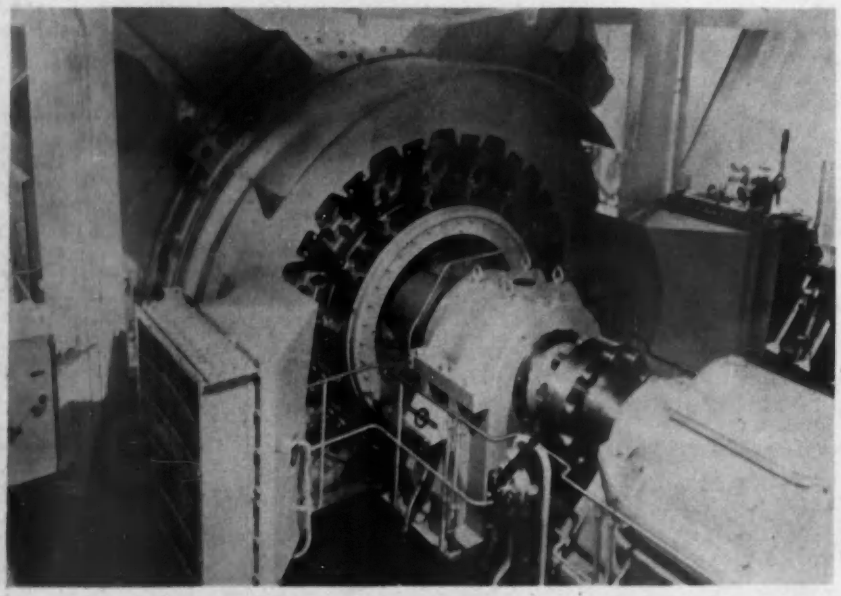
Development work on turbo-alternators is intense, and covers many new design features. On the generator side, designs for 120 MVA and above are in hand, and incorporate "direct-cooled" rotor windings. A constructional method for stator casings recently devised, avoids the need for any machining until the final boring. Electronically controlled flame cutters are used to shape the individual parts which can then be welded together to produce the final casing.

Switchgear and Rectifiers

A significant advance in the switchgear field was the successful development of an automatic recloser for use on rural lines up to and including 11 kV. This was dealt with in our issue of 7th October when we saw the recloser under test at Upton Warren substation of the Midlands Electricity Board. The first production units are scheduled for despatch from the Willesden Works during March 1955. Work is also well advanced on a two-switch 275 kV 7,500 MVA switching station at West Melton, using oil circuit-breakers, and due to be commissioned early this year. A 7-switch 275 kV, 7,500 MVA substation has also been allocated to BTH by the B.E.A.

The progress on the Supergrid is well-shown by the orders being received by the transformer and switchgear manufacturers. In the transformer field for example, the second BTH, 120 MVA 132/275 kV unit was installed at Staythorpe and the first similar unit for West Melton is nearing completion. Four further 120 MVA, 132/275 kV auto-transformers have been ordered, two for Staythorpe and two for West Melton, and for Drakelow B there is to be manufactured a 125 MVA, 13·8/275 kV generator transformer.

An unusual rectifier installation has been commissioned at the Ellesmere Port factory of The Associated Ethyl Co. Ltd., and well indicates the stringent requirements being made on the electrical industry by large chemical processes. The maximum output of the four-unit equipment is 22·4 MW with an output voltage of 0/420 V, and it supplies power to one electrolytic cell line producing metallic sodium. The delicate control of current required for this process is obtained by a combination of on-load tap-changing for the transformers, and grid-control of the rectifiers. The equipment is arranged to provide 48-phase rectification with all four units in service, and is provided with an automatic constant cur-



BTH double-unit 7,000 h.p. main propeller motor installed in m.v. "Leva"

400 hp. BTH diesel electric locomotive supplied to Western Australian Government Railway

rent control to maintain the cell current at its established value to within ±0·5%

Work has continued actively on the development of a 15,000 amp, 250 V rectifier of the mechanical contact type, and the high power 300 kW, 1,100 amp germanium rectifier, which has now been operating for over a year, has proved most encouraging in its performance. A second large germanium rectifier has also been built and certain others are being installed to provide basic operating data under various service conditions.

Transport

A most interesting development in the transport field is that of the combined electromagnetic coupling which can also be used as an alternator. The large electrical demands of the bulk cargo carrier with self-discharging cargo-handling gear, in the smaller sizes of vessel, which are usually diesel driven have required the installation of auxiliary generating sets of considerable size. By fitting the new coupling-alternator, the main engines can be used for generating purposes when the ship is in harbour.

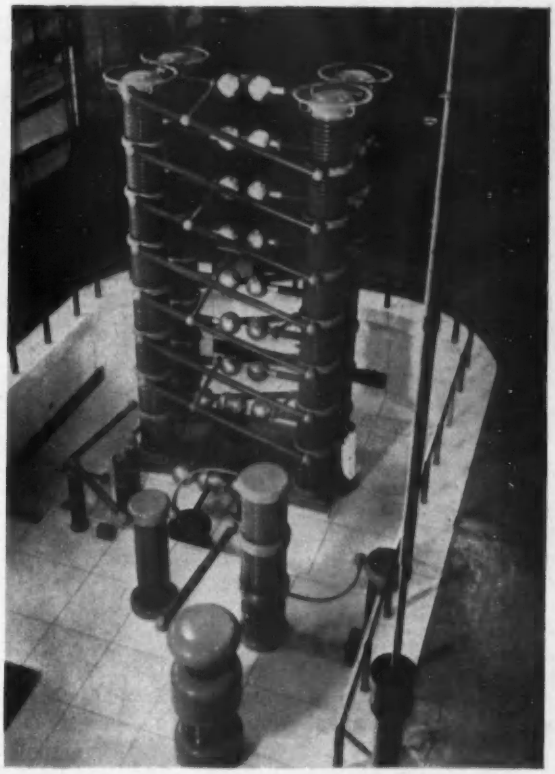
The coupling consists of two separate portions, the inner and driving member carrying a d.c. salient pole field winding and the outer and driven member carrying a 3-phase winding. The former is, of course, connected to the main engine crankshaft, while the latter is mounted on the propeller shaft. At sea, the 3-phase winding is short-circuited and the combination acts as a normal coupling. In harbour, the propeller shaft is locked, 3-phase connection made to the winding and the unit becomes an alternator. The first ship to use this type of coupling is expected to join the owner's fleet next year, and is a twin-screw vessel with two 630 h.p., 250 r.p.m. engines. In harbour, with the couplings acting as alternators, running at 300 r.p.m. each unit is capable of delivering 500 kW, 440 V, 3-phase, 50 c/s.

Diesel-electrics have continued to form a considerable part of the traction business, and all over the world this type of locomotive is increasing in popularity. A further 16 sets of electrical equipment for the 155 h.p. Ruston-BTH works shunter have been ordered, and power equipments for 200, 275 and 400 h.p. units are to be supplied to the Yorkshire Engine Co. British Railway orders in hand include fifteen sets of power equipment for shunters.

Among the work in hand or on order for traction equipment of all types, battery vehicle business has been particularly gratifying, orders having been received during the year for 280 sets of control equipment and 300 motors.

In the aircraft field, an entirely new d.c. generator was produced for use with gas turbine engines operating over a wide speed range. These generators provide an output of 200 amps at 28 V, and where two are fitted can be run in parallel with equal load sharing. The main auxiliary gear is also made by BTH with the exception of a Newton Bros. voltage regulator.

Industrial equipment orders have been satisfactory, and



Top. 3·2 MV 8-stage 4 col. Ferranti impulse generator. Energy rating 77 kW—secs. d.c. (Photo by courtesy N.P.L. Teddington)
Below. A 33,333 kVA 60 c/s single-phase 13·2/230 kV Ferranti generator transformer for Garrison Dam project, North Dakota, U.S.A.

BTH Lenticular tank 220 kV o.c.b.'s at Yallourn, Australia

much heavy equipment for mining and rolling mills has been put into operation. Electronic control has now been applied to the *Daily Mirror* group printing presses, two lines of which are driven by forty 50 h.p. BTH d.c. motors under Emotrol control. This type of control has been standardised for horsepower ratings of 3, 7½, 15, 50, 150 and 300, and can be made to cater for larger motors for particular cases. An electronic regulator for a 30 MW generator has been installed at one of the B.E.A. power stations, and a magnestat (magnetic amplifier) regulator of similar rating has been commissioned. Automatic machine control initiated by template or model following for one, two or three dimensions has been further developed, and several installations are operating or are in hand.

Lighting—street, entertainment and industrial—has continued to show intense activity. In the medical field, the first production FA5 Xenon Flash Unit has been bought by the U.S. Navy. The research leading up to this development has been long and difficult—the lamp alone is the result of over two years work.

Ferranti Transformers

From the Ferranti transformer organisation comes the news that in 1954 nearly 100 large transformers, within the range of 10 and 75 MVA, were despatched. Two of the ten 120 MVA, 275 kV auto-transformers on order for the B.E.A. are now approaching completion and the first will be ready for despatch to Ferrybridge early in 1955.

Abroad, two 100 MVA, 3-phase, 230 kV transformers were shipped for the U.S. Corps of Engineers', Garrison dam project, and other substantial shipments included large units for Roxburgh, New Zea'and; Australia, South Africa and India. The Kitimat transformers are now under load and a further order has been received for other units for this project. This comprises three 37 MVA, 275 kV single-phase units. Another order from the American continent was one for three 56 MVA, 115 kV single-phase units for the U.S. Corps of Engineers McNary Dam Project.

The use of cold rolled grain orientated core steel in the manufacture of all types of transformers has been intensively studied and new designs are being developed to ensure its most efficient use. In the distribution transformer field the problems associated with this material have been overcome and towards the end of the year manufacture of low-loss T.I. transformers with C.R.S. cores was begun. Development is also taking place in the use, under special circumstances, of other materials such as non-inflammable coolants and Class B and H insulation.

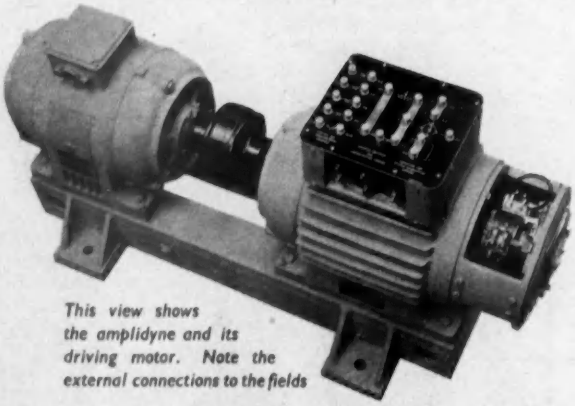
High voltage testing equipment has continued in demand, and a noteworthy installation was the 3·2 MV impulse generator for the N.P.L. Moving coil voltage regulators showed increasing popularity, and an outstanding example of this type of equipment was the "dropping coil" regulator which is designed to control the total mains input to equipments such as broadcast transmitters. Its use removes need for the fuses, contactors, motor-starters, etc., normally associated with transmitter circuits and eliminates starting current surges and voltage transients in the transmitter components. This item was developed in collaboration with the Radio Division of Standard Telephones and Cables Co., Ltd.

An Instructional Amplidyne

IN response to enquiries from universities and technical colleges requiring amplidynes for instructional purposes, The British Thomson-Houston Company Ltd. has developed a special college-type unit. The new amplidyne is of the same general construction as the industrial machine but is provided with a special terminal board in place of the normal terminal box.

It will be recalled that the amplidyne is a "cross-field" d.c. generator having a quick response together with a high ratio of output power to field power, and is used as an auxiliary exciter for equipments requiring accurate and automatic control, its many applications ranging from remote position control of radar aerials to the automatic voltage regulation of turbo-generators.

The number and design of the control fields of an amplidyne depend on the particular application involved. The fields of the college-type machine have, therefore, been designed so that it may be used in a variety of ways. All leads from windings and brushgear are brought out to



This view shows the amplidyne and its driving motor. Note the external connections to the fields

separate terminals arranged in a diagrammatic layout on the terminal board, and a set of links is provided for making the normal amplidyne connections. A tapping is provided in the compensating winding so that the operation of an under-compensated "constant-current" type of machine may be demonstrated, and a diverter resistor is also provided to allow fine adjustment of compensation over a smaller range.

The college-type machine is available in two frame sizes, with the ratings: Type CXX 3024—2 poles, 1,410/1,500 r.p.m., 220 V, 3·6 A, 0·8 kW. Type CXX 4124—2 poles, 1,430/1,500 r.p.m., 200 V, 12·5 A, 2·5 kW. The amplidyne is usually supplied on a baseplate, driven through a quickly-detachable flexible coupling by either an a.c. or d.c. driving motor of standard industrial design. The present delivery time is approximately twelve months.

An illustrated instruction book is provided with each set, giving full details of operation, construction, and maintenance.

Television as an Industrial Tool

APPLICATIONS TO BOILER OPERATION AND CONTROL

FOR many years, two problems have confronted the designers and operators of large centralised controlled boilers; one was the virtual impossibility of knowing exactly what was taking place within the furnace, and the other was how best to effect constant supervision of boiler water level. In America, for some time, television has been called in to help in the solution of these problems, and a similar attack has been under development in this country.

Reports have already been received from the U.S. that television techniques are in use for indicating such items as the smoke density emanating from chimneys, in the control rooms of power stations.

Watching Combustion

As the result of intensive work and exhaustive trials, Marconi's Wireless Telegraph Co. has introduced an Industrial Television Equipment which should prove a great asset to the combustion engineer and eight such equipments are to be installed at Willington "A" in Derbyshire. This is to be a pulverised fuel station which is started up in the conventional manner by oil-firing until the pulverised coal is well ignited and the furnace self-sustaining. The oil firing is then stopped. In such a sequence of operations it is vital that the pulverised fuel should be fully ignited, as a firing failure, if unobserved can lead to a serious explosion. To date this has been verified by direct observation through inspection ports in the furnace wall, an inconvenient procedure where the control of the whole boiler is centralised at a point some distance away. Experiments were therefore carried out using a Marconi industrial TV camera, fitted with a special air- and water-cooled lens, and installed in the explosion door aperture at the base of the boiler. The control unit and monitors were placed at a convenient point alongside the combined boiler and turbine control panel. The experiment proved successful, the engineers being able to follow at the control panel, all phases of the boiler ignition procedure and to detect conditions of imperfect combustion within the area under observation.

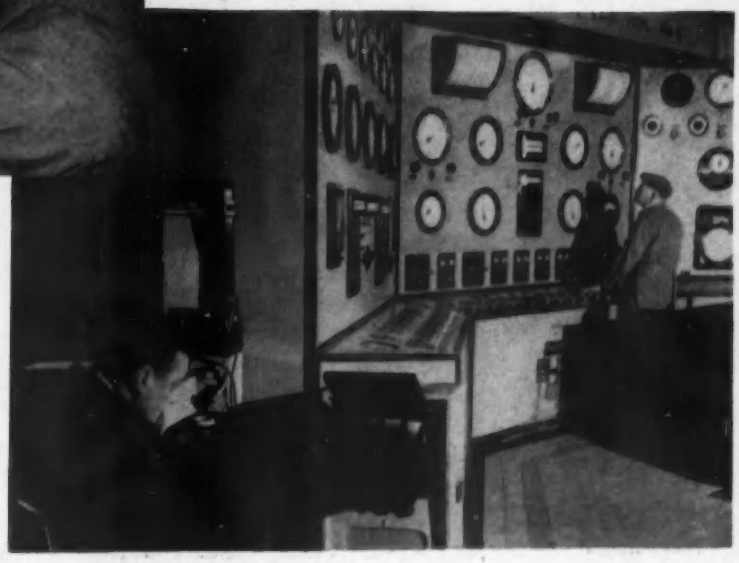
Water Gauge Readings

The second experiment concerned the relatively straightforward operation of monitoring the boiler water-level gauge. This gauge has normally to be located at the level of the steam drum at the top of the boiler, and many ingenious optical and mechanical means have been devised to produce an image or present a reading at firing floor level. Again, the desirable reading location is at the central control panel, and this can be performed by televising the image of the gauge to a suitably-placed monitor.

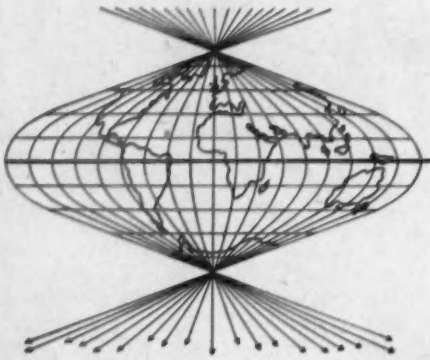
One particularly attractive feature of the application of industrial television is that it monitors itself for faults. The presence of the picture on the monitor is absolute proof that the equipment is working, in contrast with conventional alarm devices, where the absence of a warning is not in itself wholly conclusive evidence that all is well—a fault may have developed in the alarm equipment itself.

Hitherto the high cost, physical size and complexity of operation has limited the use of television for industrial purposes. Now the new Marconi equipment with a camera weighing only 4½ lb, its simplicity of operation and low cost (about £500) has greatly extended the economic use of this type of gear.

In the picture above the television camera is being fixed to the special mounting on the furnace explosion door



The picture on the right shows a monitor screen in use alongside the combined boiler and turbine control panel. Conditions inside the furnace can be clearly seen by this means



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

B.C. Expansion

The British Columbia Electric Co. Ltd., wholly owned subsidiary of British Columbia Power Corp. Ltd., will spend $38,500,000 on expansion of its facilities this year, Mr A. E. Grauer, the president, has announced. This is a new record in expenditures for the 58-year-old company. Hydro-electric projects, mainly at Seton, Bridge River, and Cheakus, B.C., will amount to an estimated $12,150,000. New substations and expansion of present ones in the Vancouver area will take $7,600,000. Other items include: electrical extension $3,950,000; expansion of h.v. system on the British Columbia mainland distribution system, $3,200,000; submarine circuit from the mainland system to Southern Vancouver Island, $1,050,000; and expansion of service in the Victoria area $1,850,000.

Mr Grauer says that by the end of 1955 the British Columbia Electric Co. will have spent about $266 millions since the end of the war in expansion of its services.

Atomic Plant

Canada will start to design this spring a small experimental atomic power plant to produce electricity, and it may begin operation early in 1958. Work on the blue prints will be started in the spring. This is disclosed in the annual report of Atomic Energy of Canada Limited, tabled in the Ottawa House of Commons by Canada's Trade Minister, Mr C. D. Howe, last week.

He did not say where it would be built, but hinted that it might be somewhere in southern Ontario. Earlier, he had stated that six or eight private industries had been invited to submit proposals for developing private atomic power plant.

300 kV Line Trouble

An interruption to the power supply to the Kitimat smelter plant of the Aluminium Co. of Canada occurred last week. The cause of the power failure, believed to be due to snow or ice, has been ascertained as damage to two or three of the 300 kV transmission line towers carrying the two power circuits over the Kildala Pass between Kemano and Kitimat, British Columbia. The extent of the damage and the time needed to rectify it are as yet unknown.

U.S.A.

St. Lawrence Plant

The Power Authority of the State of New York has placed a contract (valued at over $5 millions) for eight hydraulic turbines for the St. Lawrence Power Project with Allis-Chalmers Manufacturing Co., Milwaukee, U.S.A. Each turbine will be rated at 79,000 h.p. under a 81 ft head at 94·7 r.p.m.

EUROPE

Another Italian Plant

A new hydro-electric plant capable of producing up to 160 million kWh per annum has gone into operation at Lasa, in the Alto Arige region of Italy. Built by the Italian Montecatini group, it utilises the waters of the Martello, with a head of about 1,000 metres. Work on the plant was begun in 1953.

Swiss Station

A new power station at Birsfelden, on the Rhine, in Switzerland, has been placed in commission. The station itself is combined with navigation locks. Total cost of construction is put at around 140 million Swiss francs. The station is to have four Kaplan turbines, each of 30,000 h.p., direct coupled to four 26,000 kVA generators. The machines are being supplied by Ateliers des Charmilles S.A., of Geneva, and Escher-Wyss A.C., of Zurich. Output of the station is estimated at 440 million units annually, of which one half will be delivered to the City of Basle and the remainder to the Canton of Bale-Campagne.

MIDDLE EAST

Opportunities in Bahrain

The new 4,000 kW power station being erected in Bahrain is now expected to be in operation by the middle of this year. At present there are about 5,600 consumers in Bahrain supplied from the Government's existing diesel station which has an installed capacity of nearly 4,000 kW, but it is anticipated that during the next five years an additional 11,000 consumers will be connected. It is obvious that such development plans provide opportunities for the supply of all types of wiring equipment, in addition to a variety of domestic appliances which should appeal to the inhabitants. The supply system in Bahrain is a.c. 230/400 V, 50 cycles.

Persian Contract

The contract for the manufacture, supply and installation of four 12 MW generators for the Tehran Municipality has been placed with the French firm of Ashtom, we understand. That company's bid was the lowest, and was accompanied by an offer of ten years' credit.

AFRICA

Orders for Plant

Johannesburg City Council has placed orders for further generating sets and boiler plant for their new Kelvin power station, which is under construction some 10 miles north-east of the city. An order, valued at nearly £1 million, has been placed with the General Electric Co. Ltd. for three more 30 MW turbo-generator sets with feed heating and evaporating plant for the Kelvin power station. This brings the total number of sets on order or under construction to six. The turbines will operate under steam conditions of 600 p.s.i.g. at the turbine stop valve and a temperature of 850° F. The machines are of two casing design, with 22 stages of h.p. and 6 stages double flow of l.p. The 37,500 kVA alternators, which are air-cooled, generate at 11 kV, and have direct coupled exciters. Each set is provided with a four-stage feed heating plant giving a final feed temperature of 356° F at full load, designed and manufactured by Vickers-Armstrong Ltd. The City Council has also given a further contract to Babcock and Wilcox Ltd., for the supply of another five 187,500 lb/hr boilers for the station, making a total of 11 boilers on order or under construction for Kelvin. Consulting engineers to the Council are Merz and McLellan.

S.W. ASIA

Another Pakistan Scheme

To augment the electric supply of the Sukkur town to meet the growing demand for power, the Sukkur Muni-

cipality has decided to purchase two generating sets—one for direct current of 1,500 kW and the other for 2,000 kW alternating current. The existing generating sets have become old. The new sets will meet the needs of the growing urban population as well as the industrial concerns. It is proposed to operate these sets with diesel oil and later on with sui gas. It is also proposed to change the entire d.c. electric system of Sukkur to a.c. within the next few years.

Karnafuli Project

The foundation stone of the 2,000 ft long main dam of the Karnafuli hydro-electric project, Pakistan, was formally laid by Mr M. A. H. Ispahani, Minister for Industries. The project will ultimately provide 160 MW. Later the Minister inspected the two coffer dams, one of which was recently completed.

Plant for Burma

The Electrification Council of Burma has ordered 57 diesel-engined generating plants from West Germany, it is stated. The diesel engines are to be supplied by the M.A.N. concern and the electrical equipment and generators by A.E.G.

AUSTRALIA

Cable Order

The Aluminium Wire and Cable Co., Ltd., have been awarded a contract for over 250 miles of large sized steel-cored aluminium conductor to an approximate value of £114,000 sterling for the new 220 kV electrical grid system in Tasmania, for the Hydro-Electric Commission.

Kiewa No. 4

The first of four 15,400 kW generators at the Kiewa No. 4 generating station of the State Electricity Commission of Victoria, has now undergone tests, preparatory to being placed on load. Work on Clover Dam has been completed. It will provide the operating pondage on the East Kiewa River for a new power station. This will be the second station to be put into service at Kiewa. The big increase in power from Kiewa will be transmitted 153 miles across the mountains to Melbourne. From there it will be distributed to the metropolitan area and many parts of the State. More than two-thirds of a head-race tunnel has been excavated for Kiewa's third power station, which will have an initial capacity of 80,000 kW.

Brisbane's Hopes

It is now hoped that Brisbane City Council's new Tennyson power station will be in commission next month. At first only one 30 MW set will be operating on partial load, but by the end of 1955 two more boilers and a second 30 MW set should be in commission (until this unit is running the Council will still have to take a bulk supply from the Southern Electric Authority for the peak evening demand in winter, Mr P. A. W. Anthony, the chief engineer, has stated). Ultimately, this station will have four 30 MW generators.

Rural Subsidies

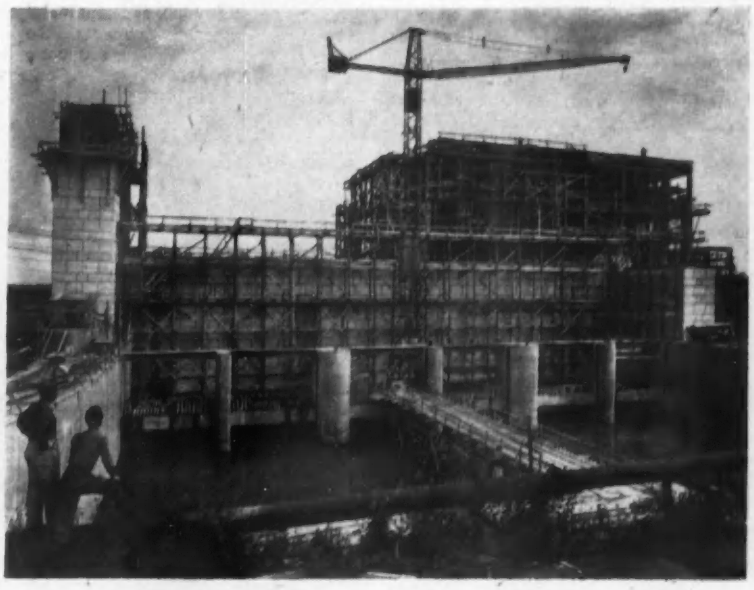
No increase in the New South Wales rural electricity subsidy could be recommended at present because of the record costs of the scheme, Mr J. F. McGrath, Minister of Housing, has stated. (A deputation had sought an increase in the subsidy from £400 to £600). Mr McGrath pointed out that New South Wales had a higher proportion of farms connected to electricity supply than any other mainland State. The supply to many thousands of new consumers was also being pushed ahead vigorously. Last year a record number of subsidy applications were received, causing the cost of rural extensions to rise to a record £3 millions a year. Mr McGrath considers that considerable extensions could be carried out within the present limit of £400. Increasing the subsidy to £600, he claimed, would only encourage the connection of supplies to a smaller number of consumers at a high cost to councils.

Explaining the scheme, Mr McGrath stated that its main aim was to assist councils' electricity supplies in the early years of low revenue from each rural extension constructed. As consumption increased over the years, subsidies would gradually decrease, until they finally ceased at the end of the tenth year. The subsidy was also so restricted that it would encourage supply authorities to construct economic extension first. In May, 1953, the capital cost limit for subsidy was increased from £250 to £400.

NEW ZEALAND

Restricting Roxburgh?

Much comment has been aroused in South Island by the revelation of Mr W. S. Goosman, the New Zealand Minister of Works, that the immediate proposals are to install only four 60 MW generators at the Roxburgh hydro-electric scheme. Apparently the general impression had been that the station was being built for an immediate capacity of 320 MW. It was stated that two generators were due to arrive from England early in 1955, while a third would arrive about the middle of the year and the fourth at the end of 1955. It has since been explained that ultimate plans are to raise the capacity to 320 MW but no indication has been given as to when that figure is likely to be reached. But local protests have been made because it is felt that with 160 MW of plant installed, "the South Island's power network would do no more than cope with the demand in much the same fashion as it is being carried today—with cuts at peak load periods".



Intended to transform Hungary's arid north-eastern Great Plain industrially, agriculturally and commercially, the Tisza hydro-electric and irrigation project will open up a wide tract of land. Our illustration alongside shows the power station under construction adjoining the Tiszalok barrage. The dam, 90 ft high, has been built in the area enclosed by a double bend of the river. Power will be transmitted by overhead line to the industrial area around Debrecen. From the barrage at Tiszalok, waters of the Tisza River are diverted into a channel which is split into two canals at Budszentmihaly. One branch, capable of taking ships up to 1,000 tons, goes down to Berettyoujfalu and the other swings south west to fill a reservoir at Nagyivan. The irrigation scheme will supply an area of 250,000 acres. Irrigation is to be either by flooding or the narrow channel method, according to the type of crop, but experiments have been carried out using water pipes with sprinklers suspended from barrage-type balloons. These were trailed alongside the canals from which water was pumped. At various points along the two main canals reservoirs have been constructed

Personalities

IN THE INDUSTRY

Lancashire Dynamo and Crypto Ltd. announce that **Mr A. J. Beanland,** general manager of their Trafford Park Works, and **Mr C. F. Jackson,** general manager of their Works at Willesden, have been elected to the board of directors of the company.

Formerly chairman of the Industrial Electrical Co., Ltd., **Mr W. E. Lawton** has resigned from the board for health reasons, we understand. As a result of severing his connection with the business he has also resigned as president of the Association of Electrical Machinery Trades. In accepting that resignation with regret, the Council of the Association have presented Mr W. E. Lawton with an engraved silver cigarette box in appreciation of his services.

The Minister of Fuel and Power has reappointed three part-time members of Electricity Boards: **Mr W. Newcome-Baker,** C.I.B.A.E., to the Eastern Board, **Mr E. T. Judge,** to the North Eastern Board, and **Ald. J. H. Bingham,** LL.D., J.P., to the Yorkshire Board. The Minister has also appointed **Mr J. E. N. Davis** as a part-time member of the Eastern Electricity Board as from 1 Mar. Mr Davis is retiring this month from the post of chief organisation officer of the National and Local Government Officers' Association. The Minister has also appointed **Ald. P. Buchanan,** J.P., as a part-time member of the Yorkshire Electricity Board.

Dr Richard L. Hearn, B.A.SC., D.ENG., has been appointed chairman of the Hydro-Electric Power Commission of Ontario, in place of Mr Robert Saunders, who died from injuries received in an air accident last month. Dr Hearn was formerly general manager and chief engineer to the Commission. Dr Hearn, who is 64, was in fact planning shortly to retire to private consulting practice, we understand. Those plans are shelved, it seems. As the result of Dr Hearn's promotion, **Mr A. W. Manby,** B.SC., P.ENG., formerly assistant general manager (administration) becomes general manager, and **Dr Otto Holden,** B.A.SC., C.E., D.ENG., previously assistant general manager (engineering), is appointed chief engineer of the Commission.

Mr Maurice J. Gartside, chairman and managing director of the Rheostatic Co., Ltd., is now on a six weeks' visit to South Africa. He will spend some time at the head office and works of the associated company, Contractor (Pty.) Ltd., at Zuider Paarl, Cape Province, and will also visit branch offices and customers in South Africa and the Rhodesias.

Changes in the manufacturing organisation of the British Thomson-Houston Co., Ltd., are announced. **Mr H. L. Satchell,** M.B.E., a director, has been appointed deputy director of manufacture to the company. On 1 Mar. he will relinquish the managership of the Rugby Works in favour of **Mr H. E. Cox,** M.I.E.E., who has been manager of the B.T.H. Willesden Works since 1946. Mr Satchell was born in Rugby and commenced his education at Lawrence Sheriff School and on obtaining a Major Foundationship continued it at Rugby School. Following war service, he took up an apprenticeship with B.T.H. in Feb. 1920, and was awarded a B.T.H. Fellowship in Nov. 1921. He proceeded to the General Electric Co., U.S.A., for one year, and on his return to Rugby in Dec. 1922, became technical assistant to the head of the Winding Department. In May 1929 he was appointed planning engineer, in June 1940, assistant manager, and in Feb. 1945, manager, Rugby Works. He was appointed a director of the company in Mar. 1949. Mr Cox was educated at the Harvey Grammar School, Folkestone, and Westminster City School. His early technical training was obtained at Finsbury Technical College. After a year of military service Mr Cox entered upon a testing course with B.T.H. at the Rugby Works in 1919. He later transferred to the Switchgear Engineering Department, Willesden, where he specialised in the design of oil circuit-breakers and bushings. In 1927 he was appointed chief designer. He became superintendent of the Engineering Department and Drawing Office in 1936, and these responsibilities remained his when in 1946 he took over the management of the Switchgear Works. During the last ten years considerable expansion has taken place at the Willesden Works. Mr Cox is also a member of the governing body of the Willesden Technical College and a member of the Middlesex C.C. Education Committee.

Deputy station superintendent at Wolverhampton generating station, **Mr R. A. Johnson,** A.M.I.E.E., has been appointed station superintendent at Cowes power station (Isle of Wight), Southern Division, B.E.A., in succession to **Mr S. C. Riggott,** A.M.I.MECH.E., A.I.MECH.E., M.INST.F., who was recently promoted to station superintendent at Portsmouth. Mr Johnson was apprenticed to the Swansea Harbour Trust before becoming a junior charge engineer at Burnley in 1920. From 1925 to 1947 he was at Doncaster generating station, successively as charge engineer, senior charge engineer, electrical superintendent and station superintendent. In 1948 he became shift charge engineer at Portsmouth, where he served as boiler operation engineer from 1951 to 1953 before going to Wolverhampton.

E. K. Cole Ltd. announce the appointment of **Mr E. Forbes** as manager of the Ekco Scottish Service Depot in Glasgow. Mr Forbes entered the industry in 1929 and since that date has held various service appointments with the E.M.I. group of companies.

The B.B.C. has announced the appointment of **Mr E. N. B. Hammond** as engineer-in-charge of the new Norwich television station. He will also continue to be responsible for the Home Service

Dr Richard L. Hearn

Mr H. L. Satchell

Mr H. E. Cox

Mr R. A. Johnson

Mr E. Forbes

transmitting station at Postwick, near Norwich, where he has been engineer-in-charge since May 1950. Mr Hammond joined the B.B.C. in 1934 as a maintenance engineer and served in this capacity, and later as a senior maintenance engineer, at the transmitting stations at Daventry and Start Point. He was also for four years engineer-in-charge of the West of England Home Service transmitter at Clevedon, near Bristol.

Regional Manager in Scotland for British Insulated Callender's Cables Ltd., **Mr R. H. Semple,** has accepted an appointment with British Insulated Callender's Cables (Australia) Pty. Ltd. He leaves this country for Sydney, Australia, this month. Mr Semple was educated at Paisley Grammar School and Allan Glen's School, Glasgow, and after a period in the Merchant Navy, in 1931 joined the sales staff of the former Macintosh Cable Co., Ltd., at Glasgow. In 1935 he was transferred to the former British Insulated Cables Ltd., on welder and moulding machine sales in Scotland. From 1940 to 1945 he was at the B.I. Company's Helsby Works, returning to Glasgow on marine cable sales after the formation of British Insulated Callender's Cables Ltd. In 1948 he was appointed manager of Glasgow branch office, and in Dec. 1952 became regional manager for Scotland.

Following the recent acquisition by the General Cable Manufacturing Co., Ltd., of most of the share capital of Britannic Electric Cable and Construction Co., Ltd., it is now announced that **Mr C. W. R. Pantlin,** chairman of the former company, has been appointed chairman of the Britannic Co. **Sir Joseph Napier,** also of G.C.M., becomes vice-chairman of Britannic.

Mr D. Preen and **Dr J. C. Simmonds** have been appointed to the board of the Radio and Television Trust.

At present assistant shift charge engineer at Roosecote power station, Barrow, **Mr F. B. Butler** has been appointed shift charge engineer at the Fleetwood power station, North West, Merseyside and North Wales Division, B.E.A.

Mr W. A. Flint has resigned from Sunvic Controls Ltd., and is taking up a position as publicity officer to Petters Ltd., Staines.

The North West, Merseyside and North Wales Division of the B.E.A. have appointed **Mr J. Almond,** M.I.E.E., as technical engineer, and **Mr J. Foden,** ASSOC.I.E.E., as transmission engineer. They both held similar positions with the old North Western Division. The appointment of the following senior assistants is also announced by the new Division: Generation Operation Dept. (Operation Analysis), **Mr E. Ward;** Generation Construction (Progress), **Mr J. H. Brown;** Generation Construction Dept. (Contracts), **Mr N. D. Hobbs** and **Mr P. R. Massey;** Transmission Maintenance, **Mr T. B. Airey;** System Development, **Mr L. W. Camprett;** District staff, **Mr P. S. Couldrey;** Telecommunications, **Mr R. C. Eastwood;** Transmission construction, **Mr T. R. Y. Graham;** Metering, **Mr P. J. Morley;** Protection, **Mr E. C. Smith,** and circuit-breaker change-over, **Mr T. A. Smith.**

Mr W. E. Swale

Mr W. F. Jarvis

Mr T. R. Warren

Consumers' engineer for No. 1 subarea of the North Western Electricity Board since nationalisation, **Mr W. E. Swale,** M.I.E.E., A.M.INST.C.E., is to retire in April. He will be succeeded by **Mr W. F. Jarvis,** ASSOC.I.E.E., A.M.I.I.A., who is at present senior assistant engineer (domestic and commercial) to Mr Swale. Prior to vesting day, Mr Swale was for five years sales manager and engineer to the Manchester Corporation Electricity Department. He was educated at the City of London School and received technical education at the Royal Technical College, Aachen, Germany, after having been apprenticed in mechanical workshops and in chemical plant. After service with Brown, Boveri and Co., at Mannheim, and Metropolitan-Vickers Electrical Co., Ltd., Mr Swale joined the Manchester Corporation undertaking in 1929 as power sales engineer, holding that position for fourteen years until promoted to sales manager and engineer. A Prestonian, Mr Jarvis was apprenticed at the Dick Kerr Works after education at Preston Grammar School and Preston Technical College. After serving the English Electric Co. as test and inspection engineer at Preston, and sales engineer at Stafford, he joined the Bury Corporation Electricity Department as sales and showroom superintendent in 1933, leaving to be the consumers' engineer to the Stretford and District Electricity Board in 1936. He held that post until nationalisation when he joined the Board in his present capacity.

Mr John V. Sheffield has been elected chairman of the Paterson Engineering Co. Ltd. As chairman he succeeds **Sir William Paterson,** chairman and managing director, who has retired from the Board. **Mr O. C. Kerrison** has been appointed managing director of the company.

Mr A. O. Glasse, M.I.E.E., who recently retired from the position of chief engineer of the Auckland Electric Power Board, and is its consultant, is to be nominated to the North Island power supply committee by the Engineers' Institute of the Electric Supply Authorities' Association. The Institute in making this move has indicated that it expects difficulties to arise in power supply and wants Mr Glasse to be in a position to give his advice. At a farewell meeting with the Board, a short time ago, **Mr J. A. Steele,** chairman, presented Mr Glasse with two silver water jugs on behalf of the Board members.

The appointments of deputies to chief officers of the South of Scotland Electricity Board is now announced. **Mr T. R. Warren,** M.A., B.SC., M.I.E.E., is to be deputy chief engineer (distribution); **Mr J. W. Moule,** B.SC.(ENG.), A.M.I.E.E., is to be deputy chief commercial officer; **Mr Andrew A. Wallace,** F.A.C.C.A., is the new deputy chief financial officer, while **Mr Alan Christianson,** A.C.A., and **Mr D. L. McDonald,** solicitor, are to be deputy secretaries. Mr T. R. Warren has been chief engineer of the South East Scotland Electricity Board since 1948. Earlier he was technical engineer for the Scottish areas of the C.E.B. Mr J. W. Moule, who has been chief commercial officer of the South East Scotland Electricity Board was also with the C.E.B prior to vesting day, being assistant engineer in charge (Commercial Department) at the head office from 1946. Mr A. A. Wallace who has been chief accountant to the South West Scotland Electricity Board since 1950, earlier held a similar position in the Glasgow Corporation Electricity Department from 1936 to 1948. Mr Christianson is another ex-C.E.B. officer, being first with the North West England district, and from 1946 senior assistant accountant for the Central and South Scotland area. In 1948 he became Divisional secretary of the S.W. Scotland Division of the B.E.A. Mr McDonald qualified as a solicitor in 1931. After experience with a private firm and as legal assistant in the town clerk's department at Edinburgh Corporation, he took up a similar post with the S.W. Scotland Electricity Board and was promoted to deputy secretary in 1949.

Viscount Cobham has been elected a director of Associated Electrical Industries Ltd.

Capt H. Leighton Davies has been appointed chairman of the Welsh Board for Industry in succession to Sir Percy Thomas, with effect from Feb. 1. Capt

Leighton Davies, a member of the Welsh Board for Industry since 1946 and vice-chairman since 1953, is assistant managing director of Steel Company of Wales and a director of Richard Thomas and Baldwins.

Mr B. J. Terrell, senior research engineer at the Wallsend research plant of the Parsons and Marine Engineering, Turbine Research and Development Association, has been appointed senior designer in succession to the late **Mr H. G. Yates.** Mr Terrell served his apprenticeship with the British Thomson-Houston Co. Ltd., Rugby, and was later with the English Electric Co. He joined the Wallsend organisation in 1946.

British Railways (Scottish Region) have appointed **Mr L. J. M. Knotts,** Assistant (Signals) at British Transport Commission headquarters, as signal engineer, Scottish Region, in succession to **Mr W. Bryson,** signal and telecommunications engineer, who retired on 4 Jan.

Mr J. M. Montague, who has been responsible for the design of most of the power stations built by the Hydro-Electric Power Commission of Ontario, has been elected president of the Association of Professional Engineers of Ontario. He has been director of engineering to the Commission since 1948.

Long service awards were recently presented to **Mr E. J. Burtenshaw,** chief draughtsman, and **Mr G. P. O'Flynn,** a senior development engineer, of E. K. Cole, Ltd., to mark the completion of 25 years' service with the company. The presentation was made by **Mr E. K. Cole,** chairman and managing director.

Mr Arthur H. Young, A.M.I.E.E., has been appointed a joint managing director of Troughton and Young Ltd.

Mr Bowman Scott has been elected to the board of the Solartron Electronic Group. He will continue his duties as personnel and training officer, a post he has held since joining the company from Urwick Orr and Partners.

Mr H. L. Briggs has been appointed to the newly created position of general manager and chief engineer of the British Columbia Power Commission. He was general manager of the Winnipeg City hydro-electric system. (We exclusively reported on 6 Jan. that Mr Briggs was resigning from the latter position.)

The Council of Manchester University has appointed **Professor Samuel Devons,** M.A., PH.D. (Cambridge), as Langworthy Professor of Physics and Director of the Physical Laboratories in succession to **Professor P. M. S. Blackett.** Dr Devons has been Professor of Physics at the Imperial College of Science and Technology since 1950, and from 1952 to 1953 he was acting head of the physics department there. His most recent work has been in the field of nuclear physics.

Following the recent transfer of **Mr S. A. Ghalib** to be Group Leader of the A.E.I.—John Thompson Industrial Atomic Energy Group, Metropolitan-Vickers Electrical Co., Ltd., have appointed **Mr R. H. Kelsall,** B.SC.(ENG.) HONS., GRAD.I.E.E., as assistant chief electrical engineer, Electronic Control Department. Mr Kelsall was educated at Bootham School (York), and Manchester University. He joined M-V as a college apprentice in 1939, and from 1943-1946 he served as an electrical officer in the R.N.V.R. After completing training with the company he joined the Electronic Control Engineering Department in 1947.

Mr R. H. Kelsall

Mr A. W. Needham

Deputy superintendent at Barton power station since 1948, **Mr A. W. Needham,** A.M.C.T., A.M.I.E.E., M.INST.F., has now been promoted to superintendent of the station, to succeed **Mr A. Willcock** who retires shortly. Mr Needham served an apprenticeship with J. Hetherington and Sons, and then joined Manchester Corporation electricity undertaking as a dynamo attendant at Stuart St in 1927. Three years later he transferred to Dickinson St as assistant switchman, but in Dec. 1932 he became junior engineer at Stuart St where he worked until 1945, latterly as shift charge engineer. After six months as charge engineer at Barton he became turbine house superintendent, and two years later was promoted to deputy station superintendent.

Mr S. J. Preston, M.A.(CANTAB.), A.M.I.E.E., F.C.I.P.A., a chief executive of the Patent Dept. of E.M.I., has been elected chairman of the Radio Communication and Electronic Engineering Association.

Mr T. W. Walsh is now sub-area engineer in the Leicester sub-area of the East Midlands Electricity Board, succeeding the late Mr J. Payne. Mr Walsh received technical training at Barnsley Technical College and Sheffield University. After several years with the Barnsley Corporation Electricity Department he joined the Leicester undertaking in 1927 as a district engineer. He became mains superintendent in 1948 and the following year was appointed deputy sub-area engineer for the Leicester sub-area.

Mr G. M. Daniels, A.M.I.E.E., general manager of Southern Areas Electric Corporation Ltd., who has been seriously ill since early Dec. is now convalescing in Bournemouth, we hear. He expects to return to business about the middle of this month.

Sir Edward Benthall, K.C.S.I., on medical advice, was obliged to resign from the leadership of the U.K. Trade Mission which left for Egypt, the Sudan and Ethiopia last weekend. Leader of the mission is now **Mr G. C. R. Eley,** with **Mr T. A. L. Paton** acting as his deputy.

OBITUARY

Mr Alexander Anderson, C.B.E., M.I.E.E., managing director of Anderson, Boyes and Co., Ltd., died on 25 Jan., aged 83.

Mr Charles Edward Cox, for forty years managing director of the White Electrical Instrument Co., Ltd., died on 26 Jan., aged 75.

Mr John Ruddock, formerly manager of T. B. and J. A. Mathieson, Ltd., of Glasgow, died on 23 Jan.

Mr Richard Smith, electrical contractor of Edinburgh, died on 25 Jan.

Mr H. E. Walker, chairman managing director of Walker Bros. (Electrical Engineers) Ltd., of Birmingham, died on 28 Jan., aged 83. He founded the firm of Walker Bros. in 1895, and the business was converted into a limited company in 1929. He was president of the Electrical Contractors Association in 1938. For 36 years he was electrical adviser to Birmingham Justices, and he was also electrical surveyor to the British Industries Fair, Birmingham.

Mr F. J. Serle, founder of the Taunton firm of electrical contractors of that name, has died, aged 72.

Mrs A. Coulthurst, area organiser for the Electrical Association for Women for the South Western and South Wales areas since 1937, died on 27 Jan.

Mr W. H. Ward, managing director of the Croydon Engineering Co., Ltd., died on 30 Jan.

Mr William Francis Furse, M.I.E.E., chairman of W. J. Furse and Co., Ltd., died on 28 Jan., aged 70. Eldest son of the founder of the firm, he was for over thirty years managing director. He was a past chairman of the I.E.E. East Midlands Centre, and of the E.C.A. Nottingham branch, and a past-president of the Nottingham Society of Engineers.

Mr Edward W. Andrews, who retired in 1952 from the position of managing director of F. Reid Ferens and Co., Ltd., has died in Sunderland, aged 79. He served that firm for fifty years.

Mr J. Milburn, sometime works director of Alfred Herbert Ltd., died on 25 Jan.

PROBLEMS AND PRACTICE

In Engineering

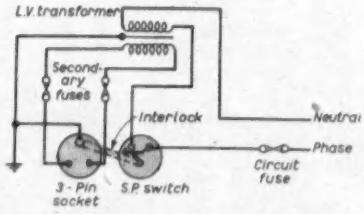
Street Lighting Wiring

THE ingenuity illustrated by Mr Clegg's "fishing story" (20 Jan.) is to be commended but should remain an isolated example of improvisation. Although erection of street-lighting poles and brackets as complete units is accepted by the manufacturers, there is no advantage in doing so.

The wiring of lanterns and assembly of gear is much more economical when treated as a workshop operation, unaffected by weather, but with tools and stores to hand. The fitted bracket can then be dropped on, sealed, gear panel fitted and all connections made with the minimum of time spent in a cramped kneeling position. There are many other advantages to this procedure and not the least is the elimination of lost or broken draw-wires.—*H. Donnachie.*

L.V. Transformers

THE drawing attached shows a simple and efficient method of controlling l.v. transformers as used for portable handlamps. It will be found that many makes of this type of unit are switched on the secondary side only. Even where the l.v. unit is connected through a switched socket, it often happens that the switch is left in the closed position with the result that the primary winding especially in situations of high temperatures receives some strain upon its insulation.



Method employed to isolate primary winding of l.v. portable lamp

In the method described, the primary is isolated by switch (2), which has to be placed in the "off" position, before the plug can be withdrawn from the socket (3). This action is mechanical, as found in the standard type of ironclad interlocking switched socket, this being the correct definition, I believe, for that which is so commonly referred to as a switch-plug. With the method described here no electrical connection is required between switch and socket. Care should be taken to see that where a connection exists in any standard unit used, it should be removed between switch and socket.

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

The transformers are usually tapped to give 12—25—50 V secondary, with outputs of 60—100—120 VA. When operating on the lower voltage rating to the higher outputs therefore, 15 amp. interlocking switched sockets should be used. The socket and the switch should be marked with the rating of the appropriate voltages to which they are connected, and as an additional precaution a metal or insulated screen can be fitted between them inside the box. For the type of l.v. transformer unit fitted with adjustable brackets as used on lathes, benches and similar positions, the method described can be applied by a simple conversion of the existing lighting fitting. —*W. H. Williams.*

Paralleling Generators

IN the interesting references to the above topic and the difficulties and suggested remedies (14 Oct. and 9 Dec., 1954) no mention is made of any effort to compare the separate load characteristics of the two machines. When difficulties are met in load sharing between two generators the first thing to do is to obtain the curves showing the variation of voltage (measured at the busbars) with load current, this test being made on each machine separately. The percentage regulation of the machines should have the same value, and the voltage characteristics should have the same shape. Should this not be the case, then series field divertors may be needed (as mentioned in 23 Dec. issue) and possibly series resistance in the negative main of one machine.

Furthermore, for satisfactory sharing of load between two compound generators, the resistance of the main from the series field to the negative busbar in each case should be such that the series fields, when connected in parallel by the equaliser, should share the total load current in the ratio of the generator ratings. In short, $(R_1+r_1)/(R_2+r_2)$ should be made equal to I_2/I_1 where I_1 and I_2 are the respective load currents of the two machines, and R and r the series field resistance and the resistance of the negative cable to each machine respectively. Further, P_1/P_2 where P_1 and P_2 are the resistances of the positive cables, should have the same ratio value as I_1/I_2. This can best be obtained by choosing the length and cross-section of the cables to the new machine (the machine which is presumably being installed to assist the machine already working) to give the above ratio value. The load characteristics should, of course, be obtained when each machine is driven by its own prime-mover, and thus the effect of each prime mover governor is included in the resultant curve.

One cannot agree with C.L.D. that with an equaliser connecting two series fields in parallel it is possible for one field to reverse its polarity. The equalising connection makes this impossible of occurrence.—*R. A.*

Cutting into Concrete

THE description by "M.N." of a method of cutting holes through concrete is very useful and I fully concur with him in his reference to the reluctance of building contractors to carry out this work, even when the specification calls for them to do the cutting away and making good. A suggested improvement is that the sludge formed by water and powdered concrete can more easily be removed from the hole by using a short piece of conduit. When the conduit is pushed into the hole, the sludge is forced up its bore, and can readily be removed with the conduit, and then shaken out. This, I have found, leaves a hole that is practically clear, whilst removing the sludge by the end of the chisel can be rather awkward when the hole gets more than a few inches deep.—*W. Satchwill.*

Tracking Fuse

THE letter by Mr H. T. Williams giving further information on his "Tracking Fuse" and the figure he got on test is quite interesting and does appear to prove his point. However, this is the first time I have heard of such a case and it would be interesting to hear if others have had the same experience. The fuse would seem to have partly cleared due to a small overload, but the back e.m.f. of the plant running on the circuit only allowed a relatively small p.d. to exist across it and hence only small power—insufficient to blow it. It should not track, even so, and I feel that this is something in which the makers should be interested, as it does point to a possibility of unreliability under certain circumstances should other people also have found this happen. As the plant involved included a hoist, the results might have been serious.

I look forward to other comments on this, but meanwhile my own faith in h.r.c. fuses is unshaken.—*I. Gore.*

Canadian Hydro Power in 1954

THE annual review of hydro-electric power progress in Canada, covering the year 1954, reveals that a new high record of 1,758,450 h.p. capacity was completed. This exceeds the previous high year, 1952, by nearly 700,000 h.p., and brings the total installation in water power plants in Canada to 16,684,200 h.p. representing something less than 26% of all known Canadian resources.

The greatest single addition was that of 735,000 h.p. in seven units in the Sir Adam Beck-Niagara No. 2 station of the Hydro-Electric Power Commission of Ontario, but the 450,000 h.p. marking the completion of the first stage of the Kemano-Kitimat project of the Aluminium Company of Canada was also an outstanding achievement.

New plants and extensions which are under construction for operation in 1955 total about 1,000,000 h.p., and for later years about 2,500,000 h.p. In addition there are several sites of high capacity which are under active investigation.

In British Columbia — apart from Kemano—the Consolidated Mining and Smelting Co., of Canada, Ltd., completed the first stage of the Waneta development on the Pend d'Oreille River, comprising two 120,000 h.p. turbines operating under 210 ft head. Provision has been made in this plant for two further units when required. Several projects were completed or under development by the British Columbia Electric Co., Ltd., and noteworthy is the beginning of work on the second 100-mile transmission line from Bridge River to Vancouver. This line will operate at 345 kV, the highest yet on the American Continent. An order has been placed for a 132 kV, 120 MVA submarine cable to connect Vancouver island to the mainland.

In Southern Yukon and northern British Columbia, Northwest Power Industries continued investigations into a major hydro-electric development similar to Kemano, but with a higher ultimate capacity of perhaps 4,300,000 h.p. The site to be used for metallurgical purposes, would be on the Taku River in B.C.

The Sir Adam Beck development in Ontario has already been mentioned, but in addition the Hydro Commission is at long last engaged on the St. Lawrence River international development. The project which is to be shared with the New York State Power Authority involves a main dam and a power house between Barnhart Island and the Canadian shore, and two control dams, one located at the foot of the Long Sault Rapids, between Barnhart Island and the American shore, while the other will span the single main channel below Galop Rapids near the village of Iraquois.

To dewater the power house site, two cofferdams, one 500 ft long and the other 4,500 ft long are now under construction, and should be finished by the end of Mar., 1955. Construction of two access tunnels under the present navigation canal, and of a Bailey swing bridge over it will begin in Dec. Construction of the power house itself will begin in Apr. Tenders have been called for the supply of the sixteen 75,000 h.p. turbines. The first unit is scheduled for 1958.

In Quebec, comparatively little new plant went in during the year, but the Quebec Hydro-Electric Commission continued work on the Bersimis River project designed for 1,200,000 h.p. in eight units, of which the first three should be generating in 1956.

Among many other schemes in the province is the Gatineau Power Co.'s Paugan Falls development where a new 47,000 h.p., 60 c/s machine is being installed anticipating the changeover from 25 c/s in this area. Arrangements have been made with the Canadian Paper Co. for the sale of off-peak power to be used in two 20 MW electric boilers.

In the Eastern provinces of New Brunswick, Nova Scotia and Newfoundland, development has been steady, although in the last-named province, it is interesting to note that investigations are now in hand on the possibility of utilising the Grand Falls power, estimated at about 3,500,000 h.p. The completion of the Knob Lake-Sept Iles railway and recent improvements in long-distance transmission make power development more economically feasible.

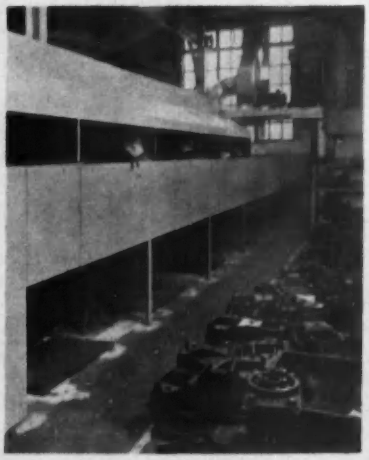
Moderate additions to thermal electric capacity were also made in certain areas where this form of power generation has so far proved more economical using local fuel.

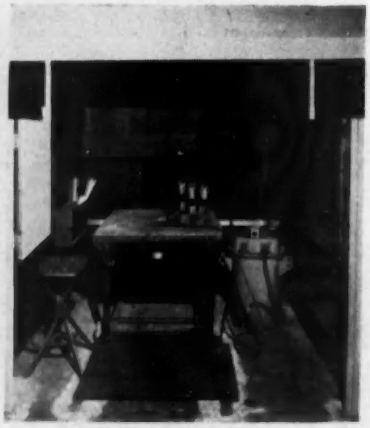
A NEW ARC WELDING SHOP

THE use of welding in the maintenance of electric rolling stock has rapidly increased over recent years. To cater for this requirement a new welding shop has been provided at London Transport's railway Central Overhaul Works, Acton. The bulk of work consists of the fabrication of structural components of steel, and is normally carried out by a.c. welding, but in some instances particularly with non-ferrous metals, d.c. welding is used.

Two parallel rows of welding booths have been provided, four in one row for d.c. work and six in the other for a.c. welding. The d.c. current is supplied from two double-operator generators, while a.c. is from a six operator welding transformer, supplied by the English Electric Co., and has a maximum rating of 300 amps per operator. This transformer is mounted on an overhead gantry and current is distributed through cables carried in a longitudinal steel duct on the panel which forms the backs of the welding booths. Each booth contains a regulator, capable of handling welding currents up to the maximum, the connection between the regulator and the distributor cable being by plugs and sockets, as is the connection to the electrode holder. Each phase of the transformer supplies an adjoining pair of booths. Fumes produced during the welding processes are withdrawn through exhaust ducts, one to each row of booths; these ducts are connected through apertures of pre-set dimensions with the canopies covering the rear part of each booth. Fans eject the fumes to atmosphere.

An electric travelling crane, of 2-tons capacity supplied by the Wharton Crane and Hoist Co., and provided with floor-operated controls, handles heavy items.





Above is a general view of the shop showing one of the rows of new welding booths. At the far end of the row can be seen mounted on a gantry the fume exhaust fan and the main welding transformer for the installation. On the right is a close-up of the interior of these booths

NEW LITERATURE

Electric Traction

by A. T. Dover, M.I.E.E., A.M.AMER.I.E.E.

THE first edition of this well-known textbook on electric traction appeared as long ago as 1917, and it is perhaps a significant commentary on railway electrification progress, that the second edition appeared in 1929 and this—the third—in 1954. An extensive revision of the text has however been made partially due to recent developments in the field of 50 c/s single-phase traction supply, and partly because of the introduction of locomotives which utilise electric drive and control although they carry their own gas turbine or diesel prime mover.

Although the operating fundamentals of electric traction—which are, of course, based on the laws of motion—have remained unchanged, the equipment used has steadily developed both in efficiency and complexity and it is in the part of the book devoted to descriptions of control and other equipment that the major changes have occurred. There can be no doubt that the popularity of the previous editions will be maintained in this latest work. Third edition, published by Pitman, 441 pages, 9 in. by 5¼ in. Price 30s.

Mass Spectrometry

by A. J. B. Robertson, M.A., PH.D.

MASS spectrometry is a branch of chemistry in which the relative abundances of various elements and isotopes in a substance are estimated by noting the deflection of appropriate ions in electric and magnetic fields. Provision of the necessary apparatus is obviously to a large extent an electrical engineering problem, and for electrical engineers the main interest of this readable little book is the close attention it gives to the electrical phenomena that are of importance in mass spectrometry as a method of analysis. Published by Methuen and Co., Ltd., 135 pages, 6½ in. by 4 in. Price 8s. 6d.

Acoustics

by Leo L. Beranek

OF all the sensory faculties possessed by the human being, none has come under such recent intensive scientific investigation as that of hearing. Many factors have contributed to this; the widespread telephony networks, wireless, music, and entertainment are all ultimately dependent on the establishment of accurate ultimate reproduction of originating sounds.

In this volume, which is based on a course of acoustics developed by the author for teaching senior and first-year graduate students at the Massachusetts Institute of Technology, the subject is treated in an unusually rigorous and mathematically exact method. The first section of the volume deals with the basic wave equation and some of its more interesting solutions are discussed in detail. Sound radiation and components of acoustical systems such as microphones, loudspeakers, and horns are other subjects covered. Extensive treatment of sound in enclosures, methods for noise reduction, hearing, speech intelligibility and psychoacoustic criteria for comfort and clearness in hearing, makes the book eminently suitable for practical working. Indeed, throughout, practical considerations are predominant. All engineers concerned with telecommunications and sound, as well as architects responsible for the design of halls to be used for music and entertainment, will derive considerable aid from the information and data given. Published by McGraw-Hill, 481 pages, 9 in. by 5¼ in. Price 64s.

Kempe's Engineers Year Book, 1955

Edited by B. W. Pendred, M.I.MECH.E., *and C. E. Prockter*, M.I.E.E., M.I.MECH.E.

THIS year's edition of Kempe's in its now familiar two-volume form is the sixtieth. No specially notable changes mark this diamond jubilee of this famous engineering handbook, however. The 1954 edition was extremely thoroughly revised, and it is only in the small details that the present volumes differ. The section on electronic engineering is the most altered of those sections of the year book that are of direct interest to electrical engineers, but even here the changes are very small. In the more general field, the cross referencing which is so essential a feature of any such handbook, has been somewhat extended. In the main, though, it is the 1954 edition again; and that is a very satisfactory standard to attain. Published by Morgan Bros. (Publishers) Ltd., 28 Essex St, London, W.C.2, 2 volumes, 1345+1413 pages. 60th edition, price 75s.

Laplace Transforms for Electrical Engineers

by B. J. Starkey, DIPL. ING., A.M.I.E.E.

TO the electrical engineer, the language of mathematics can rapidly become difficult to follow when the field of study departs from familiar ground. In many cases, such familiarity may not extend much beyond differential and integral calculus, vector analysis and complex numbers, so that there is, even now, only comparatively little realisation of the Laplace transformation as a tool in solving a host of engineering problems. For this reason, the author has produced a book which is particularly welcome in that he employs an engineering language, and explains problems in methods which will be familiar to many. The author establishes his contact with the reader by his introduction with the familiar symbolic method, leading to Fourier transformations. From this opening he progresses by way of generalised impedances and cisoidal oscillations to an introduction of Laplace transformation, and the application of Laplace transforms to circuit theory. Functions of a complex variable are then considered, with a thorough discussion of integration in the complex plane and contour integration. The theory of Laplace transformation is now discussed, with its appplications and theorems, inverse transformation, and finally, generalisation of the transformation theory. Appendices consider analytic and higher mathematical functions. Published for *Wireless Engineer* by Iliffe, 279 pages, 8½ in. by 5½ in. Price 30s.

The Oscilloscope at Work

by A. Haas and R. W. Hallows, M.A.(CANTAB.), M.I.E.E.

OVER a wide field of electrical and electronic engineering the cathode ray oscilloscope has become a maid of all work, with a remarkable versatility. Yet, it is doubtful whether all its applications have been fully, or even partially, exploited, and to that end comes this eminently practical guide. Originally published in France, this book discusses a wide range of c.r.o. applications, with emphasis on radio and television engineering. It is not only a translation of Mr Haas' original book but a completely revised work, being fully in line with modern British practice. An opening discussing general characteristics of the oscilloscope leads to a survey of the techniques of investigating electrical quantities, to be followed by considerations of application to individual fields of study. In this way, a.f. and r.f. amplifiers, oscillators, rectifiers, detectors, modulators and phase and wave changing circuits are dealt with. Final chapters consider operating troubles and improvements and additions to oscilloscopes, and its use in television circuits. Published for the *Wireless World* by Iliffe, 171 pages, 8½ in. by 5½ in. Price 15s.

BOOKS RECEIVED

Directory of Welding and Fabricating Equipment: Section 1: Metal-arc welding electrodes. Reprinted from *Welding and Metal Fabrication*, gives details of electrodes now available in U.K. for welding any of the metals used in fabricating industries. Published by the Louis Cassier Co., Ltd., Dorset Hse, Stamford St, S.E.1, 35 pages, 11½ in. by 8½ in. Price 3s. 6d. (by post 3s. 9d.).

Silver Plating. Outlines in a practical manner the various operations which may be required to produce satisfactory results. Published by Johnson, Mathey and Co., Ltd., 73-83 Hatton Gdn, E.C.1, 35 pages, 9½ in. by 6½ in. Gratis (Reference No. 1851).

Studio Engineering for Sound Broadcasting, edited by J. W. Godfrey. Compiled by members of B.B.C. Engineering Division, intended primarily for training B.B.C. staff in general procedures, underlying operational procedure at studio centres. Published for the *Wireless World* by Iliffe, 208 pages, 8½ in. by 5½ in. Price 25s.

Equipment for Industry

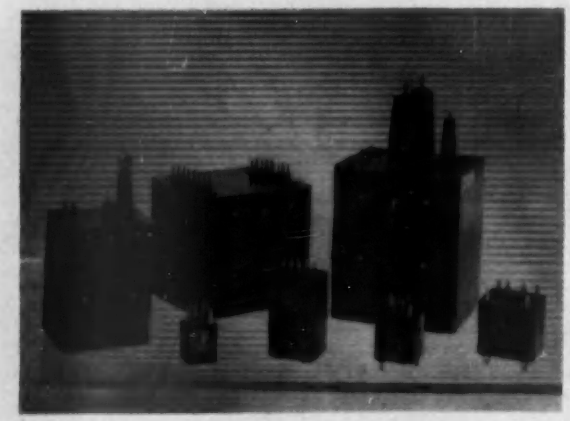
•

"Potted" Small Transformers

DURING the war, the necessity for equipment to be sealed against the ingress of moisture under widely varying conditions of temperature and humidity, led to the development of special resins. Applied by the well-known techniques of vacuum-impregnation and enveloping, these resins then gave the weather protection required, but possessed little mechanical strength.

Recently, new resins have been made available which, when employed in casting techniques, impart high mechanical strength in addition to sound electrical properties. A new range of transformers and chokes "potted" in these casting resins has recently been introduced by FERRANTI LTD., Ferry Rd, Edinburgh 5, who hold a "Limited type approval certificate" issued by the Radio Components Standardisation Committee for these components.

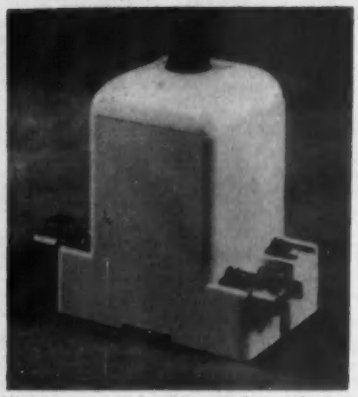
The technique of resin casting consists of encapsulating the core and coil assembly in a solid block of resinous material, the terminal insulating posts being cast integrally. The insulation resistance of these cast equipments is said to be about a thousand times greater than specified minima, and where high voltage windings are employed, some reduction of physical dimensions is said to have been found possible. In addition the components are claimed to withstand ranges of temperature in excess of the specified −40° to +110° C. The new range, which is named the "Portland" series, is said to be specially suitable for use in all electronic equipment, where reliability and high quality are essential.



With these components, resin casting techniques are employed. Even terminal insulating posts are of resin

"Elfa" m.c.b. now available

RECENTLY an I.E.E. paper focused attention on miniature circuit-breakers and discussed the extent to which they are being used in Great Britain. In contrast with the numbers employed in America and on the Continent ,the use of such breakers has been limited, although they seem to offer some advantages over fuses. In Germany, the A.E.G. have been making miniature circuit-breakers for many years and before the war they introduced the "Elfa" type which has the whole mechanism contained within a porcelain shell and mounted on an Edison screw base. This type has once again been made available in this country by their agents, the WELMEC CORPORATION LTD., 147 Strand, W.C.2. In addition, another type is manufactured which is suitable for panel or wall mounting, and this also is being imported. The units are suitable for operation on a.c. or d.c. supplies up to 15 A and up to 25 A, a.c. only. Thermal and magnetic trips provided, protect against both short circuits or sustained slight overloads, and the magnetic unit cuts in almost instantaneously when loads of five times full-load current or more are experienced. Over thirteen million of these m.c.b.'s are said to have been supplied since their original introduction.



Miniature circuit-breakers similar to the type illustrated above are being widely used on the Continent

Careful attention to assembly and construction has enabled a competitive price to be offered for this range of magnetic separators

Separator uses permanent magnets

A NEW range of magnetic separators has been introduced by RAPID MAGNETIC MACHINES LTD., Lombard St, Birmingham 12. These machines, designed specially for use as swarf separators employ two "Alcomax" permanent magnets to provide the separating force. Material requiring separation is fed into a hopper at the top of the machine, from which it is fed, at a controlled rate, via a shaker-feeder on to a drum. As the drum rotates, non-magnetic material falls into a chute and the magnetic swarf is scraped off at a convenient point. Drives for the shaker-feeder and drum are provided by a built-in motor which has local push-button control. These machines, in the "JYP" range, are capable of handling from 20 to 80 cwt of material per 9-hr day.

Motor Standardisation

WITH the recent change of dimensions for standard protected type motors and the reduction in frame diameters to only four standardised sizes, by the National Electrical Manufacturers Association (N.E.M.A.), a considerable advance in standardisation has been made. LANCASHIRE DYNAMO AND CRYPTO LTD., St. Stephens Hse, Victoria Embankment, S.W.1, have now announced their new "Anglo-American" (AA) range which conforms to the latest N.E.M.A. requirements and is suitable for operation on 50 c/s mains at the same rated output as for 60 c/s. These motors, made in two types, protected (AA), or "Fankuld" totally enclosed (EAA.), are particularly suitable for use on machine tools which are to be exported to dollar areas.

The electrical performance of the range is in accordance with B.S. 168 and all machines have Class "A" insulation. In order to facilitate maintenance, metric size ball or roller bearings have been used throughout. All motors are wound for 3-phase operation and are available in ratings up to 40 h.p. (type AA) and for the totally-enclosed "Fankuld" type this figure is 25 h.p.

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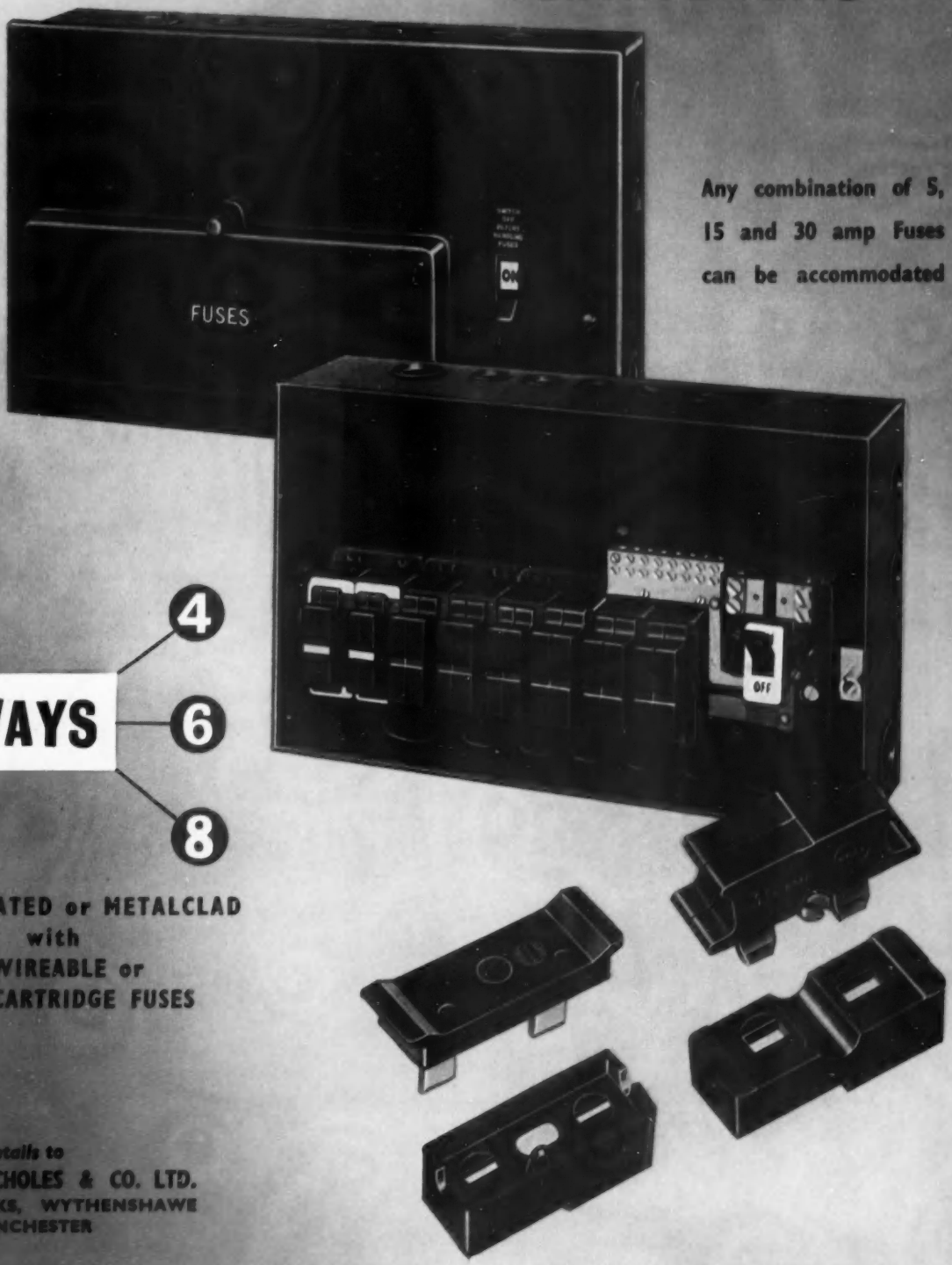

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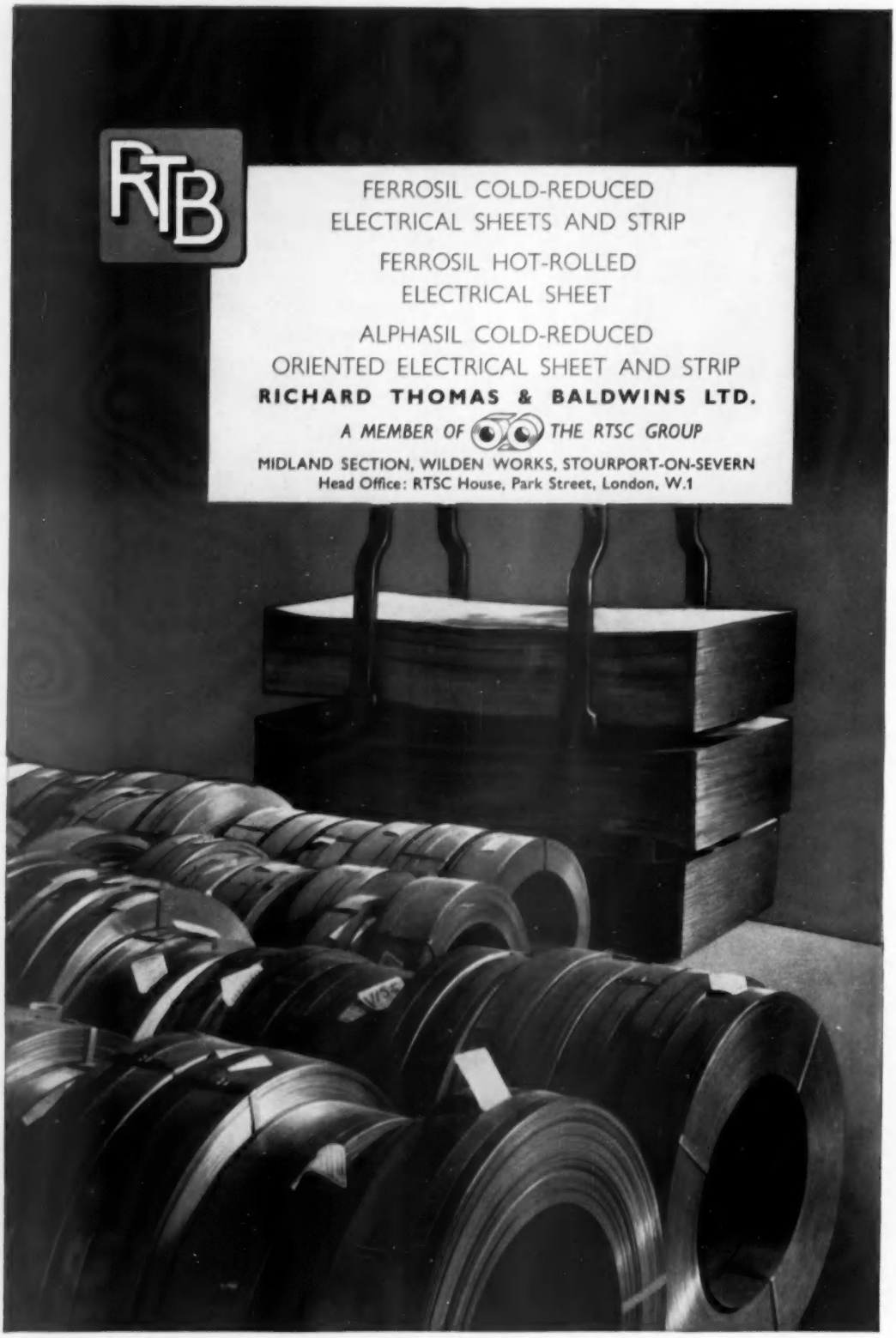
WYLEX WORKS, WYTHENSHAWE
MANCHESTER


RTB
FERROSIL COLD-REDUCED
ELECTRICAL SHEETS AND STRIP
FERROSIL HOT-ROLLED
ELECTRICAL SHEET
ALPHASIL COLD-REDUCED
ORIENTED ELECTRICAL SHEET AND STRIP
RICHARD THOMAS & BALDWINS LTD.
A MEMBER OF THE RTSC GROUP
MIDLAND SECTION, WILDEN WORKS, STOURPORT-ON-SEVERN
Head Office: RTSC House, Park Street, London, W.1

Simplex Cooker Timer

DESIGNED for easy installation in partnership with existing cooker control units, the new Catalogue 3807 Timer introduced by SIMPLEX ELECTRIC CO., LTD., Oldbury, Birmingham, affords up-to-date timer cooking to owners of ordinary cookers.

With the unit, most of the easy cooking facilities afforded to owners of expensive "super cookers" become readily available to owners of the less expensive models.

The cooker-timing control costs only £6. 9s. 6d. and will switch itself on, cook

Simplex have this new cooker timer control

for the allotted time, and switch itself off again. Finish is cream or white stoved enamel easily cleaned. With the use of an adaptor plate supplied at 1s. 6d., the timing switch can easily be affixed to any cooker control unit conforming to B.S. 1833.

New Prices for Wye Valley Blankets

WITH effect from 1 Jan., 1955, the washable covers for electric blankets supplied by WYE VALLEY HAND WEAVERS, Ross-on-Wye, Hereford, are chargeable with purchase tax.

All supplies from the company on and after that date will be invoiced at the following prices.

Electric Blanket 54 in. × 31 in. 220/250 V without washable cover now costs £4. 3s. 2d. plus 15s. 7d. purchase tax = £4. 18s. 9d.

As above complete with cover now costs £5. 3s. 2d. plus 19s. 4d. purchase tax = £6. 2s. 6d.

Washable cover separate now costs £1. plus 7s. 6d. purchase tax = £1. 7s. 6d.

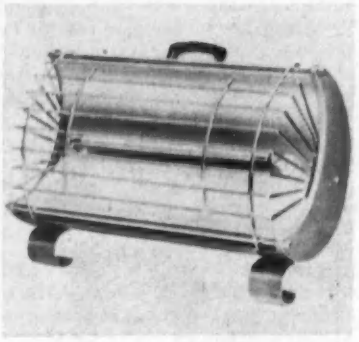
Wholesale discount is 25% on the nett retail price.

Hawkins "Marilyn" Fire

NEW model fire just introduced by L. G. HAWKINS AND CO., LTD., 30/35 Drury Lane, Kingsway, W.C.2, is the "Marilyn" which we have illustrated below.

Selling at 59s. 11d. inc. tax the Marilyn has been designed as a "safety" portable model and is suitable for use in bathrooms and nurseries where it can be hung on the walls by special bracket provided. The loading is 1 kW and the standard colours are mushroom, silver and cream.

The Marilyn fire is ideal for floor or wall fixing

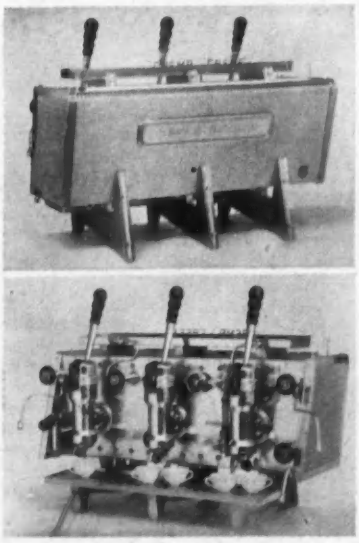


"Espresso" Machines for U.K.

WITH the price of tea fast overhauling that of coffee it is possible that coffee drinking will oust a firmly established national habit and coffee houses of the eighteenth century pattern may dominate the social horizon. Certainly the number of stylish bars springing up all over town substantiate this. Root of their success can be attributed to introduction of the pressure coffee machines so beloved on the Continent.

THE ESPRESSO COFFEE MACHINE CO., 24 Eastcheap, E.C.3, has now arranged for the import sales and after sales service of no less than 35 models of these machines. 32 are from Italian makers, including Brugnetti, Luigi Scapolo and Simplex, of Milan, and three are "Teddy" models from Otto Swadlo of Vienna. We understand that delivery dates range from delivery from stock of some models to a limit of thirty days for others.

The units can all be electrically heated and working at a pressure of 18 lb per sq in. afford from 1 lb of coffee up to 110 cups rivalling the best brews of the Continent. On all models a steam jet is provided for heating milk in the "Capachino" fashion.



This is the "Aurora" Espresso machine

For the Electrical Trade

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Philips "Infraphil" Infra-red Lamp

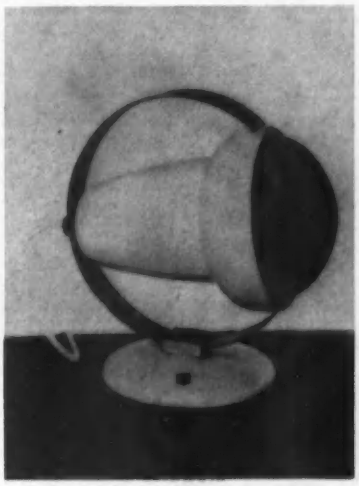
AN improved infra-red lamp, the "Infraphil," for which a number of advantages in the fields of analgesia, physio-therapy and beauty culture are claimed, has been introduced by PHILIPS ELECTRICAL LTD., Century Hse, Shaftesbury Ave, W.C.2.

"Infraphil" emits infra-red rays of a wave length of about one thousandth of a millimetre which penetrate the skin to the underlying tissue.

Tests have shown the lamp to be effective in the treatment of rheumatic pains, lumbago, sprains, and similar conditions.

"Infraphil" has been employed, in conjunction with skilled massage, as an aid to muscle stimulation and, conversely, for the easing of muscular strain.

"Infraphil" will be available through chemists, hairdressers, sports dealers and electrical dealers. It is fitted with an untarnishable reflector, and can be stood on its base or hung from the wall. The circular arm can be adjusted so as to turn the lamp in any desired direction. For mains voltages 110-250 V; power consumption 150 W. Price: 5 gns (tax paid).



Ease away pain with the "Infraphil"

NEWS OF THE WEEK

No Regular Date for P.T. Changes

"Any-Time" Statement departs from Hutton Committee Proposal

THERE will not be a regular time each year for the announcement of any changes in purchase tax rates, the Chancellor of the Exchequer stated in the House of Commons last week. Before 1953, tax changes were incorporated in Budget statements, but following numerous suggestions last year the Chancellor obliged the trade by announcing changes in January, at the time when retailers' stocks were at their lowest. Mr Butler stated last week that the P.T. Orders recently laid before Parliament were designed to meet special situations which needed rectifying without delay, from which it can be deduced that although the timing of the announcement coincided with that of 1954, it was not a repetition of last year's action. Mr Butler went on to say that there were exceptional circumstances last year which he considered sufficient to justify the unusual course of saying in February that he did not contemplate further P.T. changes in the Budget. The changes could be made at any time, and in future there would not be any regular time of year for such changes. He added that no inferences should be drawn. It was too early to say what, if any, alterations it might be right to make this year. It would be unwise to take the present statement as pointing to the likelihood of P.T. changes in the next Budget.

If from Mr Butler's statement it is to be inferred that changes will be announced any time, it will go directly against a recommendation of the Hutton Committee on Tax-Paid Stocks who published their report in 1953. It was suggested then that changes in purchase tax at any one time on any class of goods should be relatively moderate, and in general to make such changes only at the time of the Budget so far as at all possible. If, on the other hand, changes are to be included in the Budget, many traders will continue to suffer inconvenience.

November TV Sales set a New Record

SALES of television sets last November reached an all-time record, even exceeding those prior to the Coronation celebrations in May, 1953, according to the latest figures issued by the R.T.R.A. Previous highest figure was 18·74, 3·45 less than the November figure of 22·19. This in turn exceeded the October total of 18·34 and the higher rate was maintained over 1953 figures. Radio sales in November were slightly down on the previous month but were still well above those of the corresponding months of 1953. Average number of sets sold per shop was as follows:

	1954	1953
Radio:		
October ...	15·08	10·01
November ...	14·68	10·07
Television:		
October ...	18·34	15·27
November ...	22·19	16·00

Once again the Association has issued figures showing the percentages of sets sold on hire purchase. More radio sets were sold in this way in November than October; actual figures being 53·9 compared with 52·89. On the other hand fewer TV sets were under hire purchase agreements. 62·85% of TV sets sold in November were on H.P. as opposed to 65·99% in October. This trend was very similar to that of 1953 although the actual numbers easily exceeded that year's.

Sign Competition extended for a Week

CLOSING date for entries in the Electrical Sign Manufacturers Association's Sign Design Competition has been extended. Entries should now reach the sponsors' offices by next Monday, 7 Feb. The competition was announced last October, its purpose being to foster an improvement in electric sign design techniques. There are to be three prizes, of £100, £50 and £25, at least one of which will go to an amateur designer. Competitors were asked at that time to submit entries before the end of January. Prizes will be presented at the Association's annual lunch next month.

POWER EXHIBITION IN MONTREAL NEXT NOV.

CANADA'S Power Show is to be held between 8 and 11 Nov. in the Show Mart Building, Montreal. It is sponsored by the Institute of Power Engineers and is designed to cover the whole range of products connected with the electrical power industry. At the same time there will be technical sessions, panel discussions, lectures and films dealing with the various aspects of power plant, building, heating and ventilation, factory maintenance and tools, machinery and equipment used for their operation, repair and new construction.

At the exhibition, booths will be a standard 10 ft sq and will cost $230. Corner sites will cost $280. Exhibitors may also have their films (16 mm) shown in one of two projection rooms at various rentals. Further details may be obtained from, and applications should be addressed to, the Institute's General Secretary at 410 Bloor St East, Toronto 5.

Y.E.B. hope to Carry Burden of Salary Increases

INCREASES in salaries and wages announced recently will have a marked effect on the finances of all the Area Boards. The new situation was discussed by members of the Yorkshire Board last Friday, and it was eventually decided that no increase in prices of electricity was immediately necessary. Additional cost of these pay rises in the remainder of this financial year is estimated at £200,000, although in a full year it will be about £500,000. A statement issued after the meeting mentioned that the Board's financial position was finely balanced, their 1953-54 surplus of £269,143 being only ·88% of total income. It was hoped however, that the increased costs could be borne without raising tariffs, presuming the policy of economic reorganisation continued and sales of electricity rose.

B.S.I. Consumer Council holds First Meeting

FIRST meeting of the B.S.I.'s Advisory Council on Standards for Consumer Goods was held last Friday. They decided to examine questions raised by individual consumers as a means of acquiring reliable information to pass on to industry, and of preserving maximum goodwill between producers and consumers by clearly dividing justified and unjustified complaints. The Council indicated that it would not be part of their functions to voice broad and generalised criticisms.

In a clear-the-air debate most members conceded that in general consumer goods industries served the public reasonably well. Goods of adequate quality and in wide variety were available, but the public often lacked the knowledge to make a wise choice. Reliable and independent advice therefore appeared necessary.

Thornhill celebrates Golden Jubilee

A DINNER, organised by the Station's welfare committee last week, marked the golden jubilee of Thornhill Power Station. This power station, with a capacity of 195,000 kW, is now one of 20 major stations in the Yorkshire Division of B.E.A. Opened in 1905 it was the first of the Yorkshire Electric Power Co.'s group of stations, and M. C. G. Richards, chief generation engineer, in the absence of the divisional controller, paid tribute to the pioneering spirit of that company in the development of electricity supply in the West Riding. A feature of Thornhill is the base exchange feed water plant, introduced there and since universally adopted. Among the guests at the dinner was Mr S. R. Siviour, chief engineer of Y.E.B. until he retired in 1950. He was responsible for supplying power to the station's first consumer. Also present was the longest serving employee (43 years), Mr J. Roberts, coal foreman.

Electricity keeping pace with Industrial Progress

EVIDENCE of electricity's part in the rise of nearly 6% in industrial production last year was given by Mr G. Lloyd, Minister of Fuel and Power, at a Birmingham meeting last Friday evening. Drawing attention to the fact that power was being supplied without winter interruptions, Mr Lloyd said the B.E.A. had successfully met a record demand of nearly 17m kW this winter without a cut.

Birmingham, he said, was increasingly dependent on electricity. The city was undoubtedly leading the general advance of British industry which meant greater power consumption. Progressive mechanisation in the motor industry had led to record production in 1954. Increased use of electricity in light metal industries was 39%, in manufacture of steel tubes it was 50%, and in drop forging, 69%. Increased industrial activity was evident elsewhere, Mr Lloyd said. In the north-west textile mills' steam engines were being replaced by electricity. In the south-west sales to industrial users had risen by 49%, while there had been notable increases in storage heating installations. The Minister cited the growth in popularity of grain dryers (226 installations in the E. Midlands in a year) as an example of agriculture's demand for power. In the domestic field, between 3,000 and 5,000 new consumers were connected each month in England and Wales.

Supper before Meetings

AN innovation at the opening meeting this year of the Electrical Traders Commercial Travellers' Association was the serving of supper at their general meetings. After the meal sectional officers gave their reports which outlined a very satisfactory year, especially as regards membership. The next supper and general meeting will be on 11 Mar.

SOME ASPECTS OF FUTURE BROADCASTING

SPEAKING last week at the Batti Wallahs Society luncheon, Mr Harold Bishop, Director of Technical Services, B.B.C., gave a short talk on "Some Aspects of Broadcasting." He considered initially the present situation where serious interference was being caused both in the long and medium wave bands by new stations broadcasting on frequencies unauthorised by the Copenhagen convention. When this convention was held in 1940, some 412 stations were considered and were allocated wavelengths designed to minimise mutual interference. Today there were 676 stations, and the number was still rising and might soon reach 800. Under these circumstances the B.B.C. had thought it necessary to embark on a frequency modulated v.h.f. system which would be largely immune from outside influences. Preliminary work carried out at Wrotham had been satisfactory. By the end of this year about 6 stations should be operating and ultimately this number might rise to 25-30. Listeners who wished to gain the full advantage of v.h.f., f.m., might be well advised to buy a new receiver in preference to using converters to adapt existing sets. The benefits of v.h.f., f.m., were remarkable and the additional expenditure well worth while.

In the television field, said Mr Bishop, it was proposed to obtain a channel for a B.B.C. alternative programme in Band III (184-216 Mc/s). Colour television had not gone as well in the United States as had been expected. Today there was only one manufacturer in U.S. producing colour sets. Technically, the subject was not advanced enough and the limited programmes transmitted were becoming more and more expensive. It also did not appear that there was hope of producing an inexpensive set for years to come. Information theory would need considerable development to enable the amount of information required for colour to be compressed into a reasonable band width. Dealing with monochrome development, Mr Bishop referred to the London-Paris cable link as part of the Eurovision network. Constant research development was being undertaken to improve the quality of the existing system.

The next Batti Wallahs luncheon will be held on 24 Feb. (Thursday) at the Connaught Rooms. At the time of going to press, no speaker has been arranged.

OFFICIAL PUBLICATIONS

BRITISH STANDARD

B.S. 1117, 1953: Fine resistance wire for telecommunication and similar purposes.

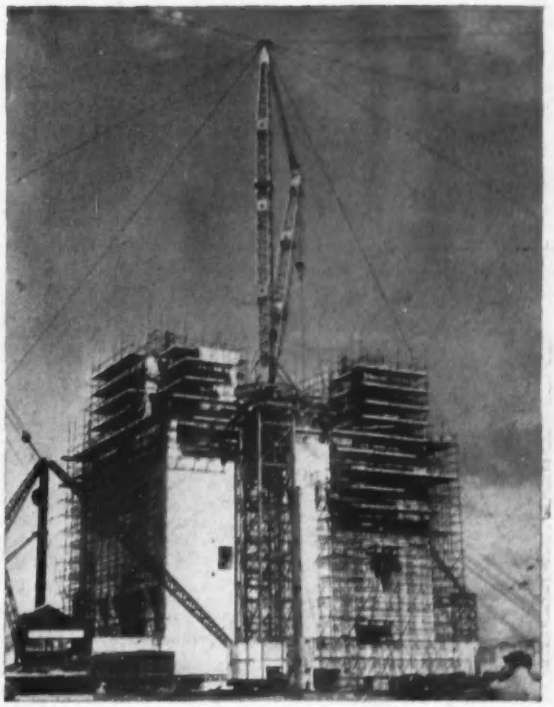
CENSUS OF DISTRIBUTION and other services, Vol. 3: wholesale trades. H.M.S.O. 15s. (see page 188).

DEFENCE SPECIFICATION

D.E.F.-20. Binding and Identification Sleeves for Use of Electric Cables and Equipment Wires. Amendment 1. H.M.S.O. 2d.

CLEAN AIR. House of Commons; Private Members' Bill. H.M.S.O. 9d.

MINES. Report of H.M. Inspector of Mines for 1952 (see page 179). H.M.S.O. 3s.



Following a number of reproductions of models we now have a photo of actual construction work at Calder Hall atomic power station. It shows one of two identical reactors. Each of these reactors is said to consist of natural uranium embedded in graphite and cooled by carbon dioxide under pressure inside a pressure cell. The carbon dioxide circulates through heat exchangers. Latest estimate is that the power station will be ready for operation next year. Civil engineering and building work is by Taylor Woodrow Construction Ltd.

E.A.W. announce Results of Examinations

RESULTS of examinations and various awards of trophies were announced by the E.A.W. last week. The 36th Certificate Examination in Electrical Housecraft for Demonstrators and Saleswomen took place on 9 Dec. and 63 candidates qualified bringing the total number of certificate holders to 2,217. Two gained distinction. Forty candidates qualified for the certificate in the corresponding examination for teachers, held on 11 Dec. Total number of holders in this case is now 1,957.

At the same time the Association awarded their three trophies. The Elizabeth Sloan Chesser Cup has been won this year by Miss Elizabeth Giblett of Leyton who was the housecraft adviser gaining highest marks in the tests for the Diploma in Electrical Housecraft. The school gaining highest marks in the Home Workers' Examination was the Worthing county secondary school, who thus gain the Councillor Miss Walter Rosebowl. This was only the second time the school had entered. Annual monetary awards given by the Cheltenham branch to successful housewives competing in the Home Workers' Certificate Examinations were won by competitors with Stoke-on-Trent branch (£5), Birmingham (£2), and jointly by two with the Aberdeen and Stoke branches.

Electricity and the Future is theme of 1955 B.E.P.C.

BUSINESS sessions at the 7th B.E.P. Convention to be held at Brighton between 27 June and 1 July will be based on the theme Electricity and the Future. The Convention's preliminary programme was published last Monday. One of the major features will, of course, be the exhibition which occupies 30,000 sq ft of the Sports Stadium in West St. A special display of catering equipment is to be staged in a marquee in the adjoining car park and cooking demonstrations will be organised by the S.E. Electricity Board. Official opening of the exhibition will be at 9 p.m. on the Monday, and will be performed by Sir Harry Railing, who will deliver his presidential address on the following morning after the Mayor's civic welcome.

The first paper will be given at The Dome on Wednesday morning by Mr J. Eccles. It is to be a 10-year forecast entitled "The Generation of Electricity in Britain." After the Brighton Rotary Club luncheon, delegates will hear three papers on "The Electrical Industry as a Career." These will be given by Sir Henry Self on the supply industry, Mr S. E. Goodall from the manufacturing aspect, and Mr R. A. Marryat on contracting. Thursday's two sessions will deal with "Electricity and the Industrial Future." Papers on the steel and coal industries, the latter by Mr B. L. Metcalf, will occupy the morning, and two more on the chemical and catering industries by Messrs G. Nonhebel and Felix A. Rogers, will be given in the afternoon. Each session will be followed by discussion. Final event will be the annual meeting on Friday, following the Electrical Forum.

Social events include the E.A.W. luncheon at the Metropole Hotel, Ladies' Tea at the Aquarium Restaurant and Reception by the Mayor and Mayoress of Brighton, at the Corn Exchange on Tuesday. Annual dinner and dance will be at the Corn Exchange on Thursday evening, and accommodation will be available for some 800 guests. There will be the usual golf competitions. A departure from usual practice will be that Tuesday afternoon and not Wednesday afternoon will be free.

New Lighting for Salford's First Roundabout

THE initial stage of a major programme for relighting the City of Salford has been completed. It involves catenary suspended lanterns along the main Bolton Rd and the first roundabout to be constructed in the city. Part of the Bolton Rd has an unusually wide carriageway which necessitated the opposite mounting of lanterns and alternate centre suspension. Existing traction poles were used to support the span wires. Attaching the lanterns to the span wires and providing access for maintenance purposes was achieved by fixing four short angle brackets to the corners of a side entry type of lantern and securing it to the span wires by "U" bolts. With the conventional top entry lantern a loss in mounting height of at least 1 ft must be accepted, quite apart from maintenance difficulties. Control gear is housed at the top of each traction pole.

Cromwell roundabout is at a five road intersection and is the first in the city. It is illuminated by sodium enclosed lanterns on Concrete Utilities' columns. About 140 sodium street-lighting lanterns supplied by the British Thomson-Houston Co. were used. The installation was planned by the City's Street Lighting Superintendent and carried out by the street-lighting department.

Cromwell Roundabout in Salford illuminated by Mazda sodium lamps and lanterns

Smoke Abatement Society welcomes Clean Air Bill

A RESOLUTION declaring their firm support for early and effective action on the lines recommended by the Beaver Committee was passed at last Thursday's meeting of the executive council of the National Smoke Abatement Society. The council welcomed the action of Mr G. Nabarro who used his first place in the ballot for Private Members' Bills to introduce a Clean Air Bill to Parliament. The Bill is due to be read a second time tomorrow, Friday.

L.C.C. Wiring Rules

AS from 1 Jan., 1956, permission to use electric wiring in wood casing for temporary installations on stands at exhibitions will be refused by London County Council. The public control committee has reported that this system of wiring hitherto allowed by the Council's rules of management of places of public entertainment, has been found by experience to be unsatisfactory. They add that alternative systems specified in the rules are readily available and in general use, and provide a more satisfactory installation.

GOOD YEAR FOR E.I.B.A. NORTHMET BRANCH

REPORT of the chairman at first annual meeting of the E.I.B.A.'s N. Metropolitan branch showed good progress throughout the year and excellent prospects for the branch's future. The retiring committee was re-elected in toto for 1955 under Mr H. G. Campbell as chairman, Mr C. C. Hill as vice-chairman and Mr T. Yule as hon. secretary. A statement of accounts will be submitted later as the hon. treasurer was absent abroad at the time of this meeting.

Firm stages Special Trade Exhibition

REPRESENTING the final form of smaller displays which have been staged throughout the country during the last two years, an exhibition of the products of W. T. Henley's Telegraph Works Co., Ltd., is now open to trade visitors at the Hotel Russell, London, W.C.1. On display are examples from the wide range of cables, distribution and installation equipment which the company manufactures. In addition to this, some examples of the test equipment used to maintain quality in Henley products are on view. Of special interest here is an electronic test panel for automatically applying to earth leakage circuit-breakers all the tests called for in the relevant British Standard. Also of note are a demonstration of the self-fluxing properties of Superthane, an enamelled winding wire which can be tinned by dipping into solder, and a device for controlling automatically the diameter of extruded cables.

The exhibition is to be open from Mondays to Fridays, 2.30 to 7 p.m., until 25 Feb. Lectures will be an additional feature on some evenings, Henley engineers and chemists dealing with cables and cable materials, and with earthing and the application of earth-leakage circuit-breakers. Further details of the exhibition and the lectures can be obtained from the company at 51 Hatton Garden, London, E.C.1, or from local representatives.

BETTER LIGHTING FITTINGS AT I.E.E.'s HEADQUARTERS

VISITORS to the London H.Q. of the I.E.E. in recent weeks will probably have noticed the new decorative fluorescent fittings which now grace the Common Room and Tea Room. Five of these fittings have been installed, two in the Common Room and three in the Tea Room. Made by the G.E.C. they measure 5½ ft by 3½ ft and contain six 5 ft tubes arranged longitudinally and two 3 ft tubes arranged transversely at the ends. A louvre frame has been incorporated and control gear is accommodated in a box inside the fitting. Glassware is flashed opal and the bronze-finished metalwork includes a honeysuckle motif at each corner. Four fittings have also been mounted on a beam in the Common Room to provide additional illumination for portraits of presidents and boards bearing the names of chairmen of sections. Employment of louvre fittings was unsuitable and consequently these fittings have white-flashed opal enclosures.

Decorative fittings in I.E.E. Common Room supplied by G.E.C.

Arbitrator hears I.o.M. Compensation Claim

LOSSES sustained by the Douglas Corporation electricity undertaking in the three years since the Isle of Man Electricity Board ceased to take a bulk supply totalled over £51,000, whereas in the three years before there had been a surplus of £27,000, it was stated during arbitration of the Corporation's claim for £148,926 compensation from the Board. The arbitrator was Mr R. W. Gregory, M.I.E.E., M.CONS.E., the consulting engineer, who was assisted by three specialist advisers. The Corporation's claim was based on the contention that substantial expenditure on repairs and extensions to their Pulrose power station was incurred to meet the demand in Douglas and in expectation of the bulk supply to the Board continuing. For the Corporation, Mr E. W. Fargher said it was with the full blessing of the Board, the Governor of Tynwald that the Corporation borrowed £400,000 in 1948 for extending Pulrose power station, just over a year, as it transpired, before the Board applied for and were granted permission to build a power station at Peel. Mr Bryan Donkin, partner in Kennedy and Donkin, consulting engineers to the Corporation, said he believed the claim, as presented, to be eminently fair to the Board.

Mr L. Douglass, the Board's engineer and secretary, refuted pleadings by the Corporation that they were not aware of an application by the Board to build its own station as long ago as 1939—which was postponed because of the war—and also that they were not given adequate warning from 1947 onwards of the Board's intention, either to participate in a joint generating scheme with the Corporation or go ahead with plans for a separate station. Mr Douglass said the Board asked in 1947 that a decision on Pulrose's extension be withdrawn until a commission had reported on a proposed hydro-electric scheme. In 1948, a month before the Commission's final report was published, the Corporation were authorised to extend Pulrose. An alternative recommendation of the Commission was the establishment of a joint authority for the whole Island. Discussions with the Corporation on that subject made no progress.

Mr R. W. Gregory, the arbitrator, said that it would be some time before his findings would be made known.

Imported Accessories Were Not Marked

A PROSECUTION under the Merchandise Marks Act of 1926 was heard at Bow St (London) court last week. Goldhill and Co., Ltd., pleaded not guilty to three summonses accusing them of selling to J. and M. Stone Ltd. a Christmas decoration set incorporating imported electrical accessories, which did not bear an indication of the country of origin. The prosecution asserted that the Act required that certain imported goods should be marked "Made in . . . " or "Foreign." A Board of Trade representative had bought a set of decorations under the name of "Starlight," which it was admitted by Goldhill had been imported from Japan. They were not marked except for the words "Export Standard" on the box which indicated that the goods were made in England.

Primary submission of the defence was that the Order applied only to articles which were imported and sold as electrical accessories; it did not apply where articles were incorporated as integral parts of appliances, as the lampholders and adaptors were in this case. The decoration set could only be used as a single article. The final submission was that if the company was found to be wrong, they had, nevertheless, acted innocently.

The magistrate, Mr E. G. Robey, said it had been proved that there was no indication of origin on the lampholders, or on the adaptor or the carton, and that these accessories were within the meaning of the Act. He could not accept the contention that he should find the company not guilty because they acted innocently. He fined the company £1 on each of two summonses and £2 on the third, with £5. 5s. costs on the third summons. Defending counsel said his clients would require a case stated.

The First Half-Century

The Royal Commission on Coal Supplies has issued Part I of its final report, which portion it describes as a "General Report". The Commissioners were to inquire into the extent and available resources of our coalfields, the rate of exhaustion, possible economies, and the effect of export of coal on the home supply. The first result of the Commission's inquiry is that our reserve of coal is larger than it was in 1871 by over ten thousand million tons, and that though more than five thousand million tons have been raised in the interval. Therefore it would seem as though the subject might be dismissed for another thirty years with an exception of a corresponding growth in the available supply. The excess is attributed partly to the difference in the areas regarded as productive and partly to new discoveries and deeper workings.
—*From our issue of 2 Feb., 1905.*

NEWS IN BRIEF

As announced in November the A.S.E.E.'s Ladies Evening is to take place this year at the Trocadero Restaurant in London on 25 Feb. There are still some tickets available which can be obtained from the Association's offices at 23 Bloomsbury Sq, W.C.1.

We are informed that all Vickers-Armstrong turbo-prop Viscounts in service for Trans-Canada Airlines are being fitted with Venner emergency lighting units which are fully approved by the Air Registration Board.

Admiral the Earl Mountbatten of Burma is to open the B.I.F. at Olympia, London, on 2 May. It will be the Fair's first official opening.

Transformers (Watford) Ltd. have been successful in securing a large order from Italy for class H air-cooled, silicone impregnated distribution transformers.

H.R.H. the Princess Royal has consented to open the Northern Radio Show, to be held at the City Hall, Manchester, between 4 and 14 May.

"Opportunity for Industry" is the self-explanatory title of a well-illustrated brochure received last week from the Trade Commissioner for the British West Indies. It deals particularly with Trinidad and Tobago.

Over 120 sat down to dinner at the Electrical Traders' Commercial Travellers' Association's Ladies Evening held at the Windsor Castle, Victoria Station, London, recently.

Extensive publicity for this year's B.I.F. is being conducted in the U.S. and Canada. Fair officials from this country as well as agents on the other side of the Atlantic have been exceptionally busy organising large-scale distribution of posters, showcards and leaflets, supplemented by Press advertising and direct-mail campaigns. The B.I.F. opens on 2 May.

Over 200 payments totalling about £6,000 have been made by the Coal Board in their Inventions Scheme over about three years.

Birmingham Exchange and Engineering Centre is now producing a monthly News Letter to give exhibitors and others an idea of the Centre's activities and encourage greater use of the facilities it offers.

Consumers in the Coventry sub-area of the E. Midlands Electricity Board may soon be able to pay their electricity bills at sub-post offices. A similar arrangement already exists in the Warwickshire and Leicestershire sub-area.

Chadwick Public Lectures to be held on 14 Feb., 15 Mar., and 20 Apr., will be on "Clean Air," "Silicosis," and "The Role of the Public Health Inspector" respectively.

World-wide co-ordinated study of the natural physical forces of the Earth has been planned to be made over the period from July 1957 to December 1958. It will be known as International Geophysical Year.

B.B.C.'s "Workers Playtime" was broadcast from Henley's factory at Birtley last Thursday.

Course for Managers

A THIRD course for managers in industry is being arranged by the University of Cambridge. Similar courses were held last year and in 1953, and their success was confirmed by the University's Vice-Chancellor, when he subsequently made enquiries as to whether or not they served a useful purpose. Object of the course is to enlarge the outlook of managers, so that they can see their work in the production, technical sales, accounting and other fields against the background of the firm as a whole, of the industry, the community and the State. It is intended primarily for managers who appear likely to reach high levels. The 1955 course will take place at Madingley Hall between 27 June and 22 July, and full details may be obtained from Mr G. F. Hickson, Stuart Hse, Cambridge.

Production Model Digital Computor

RECENTLY announced by Elliott Brothers is the "Elliott 402" digital computor which consists of an assembly of seven individually ventilated cabinets containing 223 stabilised plug-in units incorporating 615 valves, a magnetic store, stabilised power supplies and a built-in control desk. The input is by 5-hole punched tape, and output by electric typewriter or tape-perforator and page printer. Digit rate is 333,000 per second, and word length 34 digits, (2+32). The main store has 23 rotating magnetic tracks on a magnetic oxide coated drum rotated at 4,600 r.p.m. Each track stores 128 words, to give a total storage capacity of 2,944 words. Monitoring and test facilities are provided together with the necessary input perforating and output reading equipment. Power supplies are 8 kVA, 415 V 50 c/s 3-phase with neutral and earth.

An Elliott Electronic Computing Service is available to provide solutions—on a programming and machine-time basis—of design research and allied problems in commerce and industry.

QUESTIONS IN PARLIAMENT

Monopolies Commission

IN reply to questions on the Monopolies Commission last Thursday, Mr P. Thorneycroft, President of the Board of Trade, said that he hoped to receive the Commission's report into the general effect of certain widely prevalent discriminatory practices by the middle of this year. Dealing with the speed of the Commission's investigations generally, he said it was much more important that the Commission should reach the right conclusion, than that it should try to report more quickly.

In answer to other questions, he denied that the Commission had been asked to investigate increased prices of electric lamps. There was some pressure for more speedy action in the matter of television tubes, and one member alleged that in September 1939 the average cost of television tubes in America had been £8. 7s. 5d. and in September 1954 the average cost was £7. 5s. 7d. He alleged that no comparable price existed in Great Britain, due to price fixing. In reply to this, Mr Thorneycroft pointed out that the Monopolies Commission did not look essentially at prices; but was concerned with whether monopoly conditions operated in the industry selected for investigation and whether or not they were in public interest.

Grants for Research

APPORTIONMENT of the extra £91,000 allocated to research associations was explained by Mr Bevins in a written answer last Friday. He said that about £40,000 of that sum was to provide increased grants for a number of existing associations and initial grants to three others. The remainder was for capital grants to the Electrical Research Association and the Production Engineering Research Association. The money has been allocated by D.S.I.R.

The information was sought by Mr Willey who asked earlier how many applications for a capital grant had been refused. Mr Bevins said only one had been rejected.

Railway Electrification

REPLYING to a question on progress with electrification of the Shenfield-Southend and London - Tilbury and Southend line railways, the Minister of Transport said he understood that on the Shenfield-Southend line some of the preliminary civil engineering work had been completed, and it was hoped to begin the erection of the overhead electrical equipment within the next few weeks. On the London-Tilbury and Southend line planning was progressing, and the Commission has now authorised the first of the major preliminary engineering works connected with the electrification, the contracts of the fly-over and alterations to the permanent way and platforms at Barking.

Air Pollution

GOVERNMENT intentions with regard to the report on air pollution by Sir Hugh Beaver's committee were announced in the House of Commons last week by Mr. Duncan Sandys, Minister of Housing and

Local Government. Stating that the Government were still examining the recommendations, he said that preliminary discussions had already been held with representatives of local authorities and with the Federation of British Industries. These first meetings indicate that industry was ready to play its part in implementing the clean air policy, and that local authorities were prepared to accept additional responsibilities involved.

Studies and consultations had not got to the stage at which a detailed statement of plans was possible, but the Minister informed the House that, while reserving their position in regard to individual proposals, the Government had decided in principle to adopt the policy recommended by the Beaver Committee. He hoped to make a further statement before very long.

Tariff Standardisation

MOST of the modifications in tariffs suggested by the B.E.A.'s Retail Tariffs Committee have been accepted by the area boards, stated Mr Joynson-Hicks, Parliamentary Secretary to the Ministry of Fuel and Power. He informed his questioner that the report would not normally be available publicly because it is the report of a committee of the industry.

Copper Manufactures

THE report of the Monopolies Commission on the supply and export of semi-manufactures of copper and copper based alloys is now in the hands of the Government, said Mr P. Thorneycroft last Thursday. When it had been printed it would be laid before Parliament as required by the Act.

Sayings OF THE WEEK

"In the light metal industries around Birmingham the increase in the rise of electricity in the past year was 39%, in the manufacture of steel tubes it was 50%, and in drop forging it was 69%." . . . MR GEOFFREY LLOYD, Minister of Fuel and Power, at Birmingham.

"Regulation G13 provides that a condition shall be included in all leases of sites owned by the L.C.C. prohibiting application being made for a licence for the sale of intoxicating liquors. The Housing Committee have stated that this requirement is inappropriate for leases of sites for electricity transformer substations and public conveniences." . . . from the L.C.C. General Purposes Committee Report.

"There are too many fairs—thousands of them all over the world—and each of them thinks there are too many, but considers its own one is the only one that matters." . . . SIR HARRY PILKINGTON, president of the F.B.I., speaking in Belfast.

ELECTRIC SUPPLY NEWS

Agecroft

In the continuation of the hearing at the public inquiry into the objections to the B.E.A.'s proposals to extend the Agecroft power station, to which we referred last week, Mr S. N. Duguid, F.INST.F., for the Salford, Swinton and Pendlebury and Prestwich corporations (who are objecting) said he did not think that the calculations of dust and sulphur dioxide deposits made by Sir David Brunt on behalf of B.E.A. had any significance in view of the number of varying factors involved. Mr V. A. Coates, County Planning Officer, referred to figures relating to the supply and demand of electricity previously produced by witnesses for the B.E.A. In the Manchester, Bolton and Oldham area immediately surrounding the power station the output from the station was 25% more than that required. If the new station was permitted the excess of production over requirements would be about 50%.

"I appreciate that consumption in this area and others will increase, but it will increase at a slower rate in this area than anywhere else," said Mr Coates. "I suggest that instead of building this extension at Agecroft, the B.E.A. should speed up some of the buildings they have in mind for 1962. I cannot see the rate of consumption in this area increasing at the national rate. In fact, I think it will be considerably less."

Holderness

Complaints that overhead power lines had made "bird cages" of a number of Holderness villages were made at last week's meeting of Holderness Rural Council. Councillor F. Harrison, vice-chairman, said the Council's Planning Committee had been concerned for some time over the increasing number of electricity poles in the villages. Mr C. Cameron-Kirby, manager of No. 6 sub-area, Yorkshire Electricity Board, who was invited to the meeting, explained that speed in rural electrification schemes was the aim of the Board allied to regard for prudent spending. That meant overhead lines. If last year's new lines had been put underground, it would have added £200,000 to the cost. Very much more could be done with the money allowed if they were allowed to erect overhead lines.

Asked if they would consider putting lines underground at some future date, Mr Cameron-Kirby replied that he believed that when all were supplied with power, in possibly 10 to 15 years' time, the Board would reduce the tariff, giving some benefit to consumers, rather than put the lines underground.

North Eastern

At the quarterly meeting of the North-Eastern Electricity Consultative Council at Newcastle-on-Tyne, it was reported that during Sept., Oct., and Nov. last year, 270 new substations had been brought into use. The great majority of these dealt with supplies of electricity to villages and farms. In addition, high voltage supplies were afforded to 19 industrial and commercial consumers. During the same period, 166½ miles of cables and mains were commissioned; 376 agricultural premises were connected, and negotiations completed for connecting another 340. Thirteen villages were brought on supply. The North-Eastern Electricity Board have approved estimates amounting to £924,000 for supply works.

Ross-shire

The North of Scotland Hydro-Electric Board have placed a contract for the construction of a dam at Loch Fannich, Ross-shire, with John Laing and Son Ltd. The Fannich scheme, part of the hydro-electric development of the River Conon Valley, came into operation in 1950. Water is taken by tunnel and pipeline from Loch Fannich, 20 miles west of Dingwall, to a 24 MW power station at Grudie Bridge. The intake of the tunnel is in the side of the loch, 80 ft below the surface. The dam at Loch Fannich will be a "rock-fill" structure, 400 ft long and 30 ft high, with a central section of mass concrete gravity dam. It will raise the water level of the loch by about 20 ft and will increase the water storage for the power stations at Grudie Bridge, Luichart and Torr Achilty and raise the annual output of the Fannich scheme by 3 million units to a total of 82 million units.

South Wales

The South Wales River Board has decided to send a petition to the House of Lords against the B.E.A.'s proposed hydro-electric scheme for the Rheidol Valley. The board's objections to the proposals are based on the quantity of water to be abstracted from the river and fear of pollution following the disturbance of old lead mines. It is stressed that the presentation of the petition does not obstruct any negotiation between the two authorities. The chairman of the River Board, Alderman D. Owen, stated that at a recent meeting with representatives of the B.E.A. they emphasised their strong objection to the proposals that water taken off by the B.E.A. for generating purposes would, as the Bill now stands, become the property of the B.E.A. to be disposed as they think fit. Consequently this water might never find its way back to the River Rheidol.

Cardiganshire County Council, while not opposing the scheme, are urging that it should be authorised only on condition that the electricity should not be supplied to consumers outside the County until the latter was adequately supplied.

COMPANY ACTIVITIES

APPARENTLY there are two schools of thought in the great copper price controversy. Sir Ernest Oppenheimer's Anglo-American group, which includes Rhokana and N'changa has decided not to depart from the London Metal Exchange price as the basis for the sales of their metals. They are therefore in opposition with the policy of Mr R. L. Prain's Rhodesian Selection Trust Group which includes the Roan and Mufulira mines. One new point has come to light. The question of a possibility of a more stable copper price was first raised by the British Non-Ferrous Metals Federation and not by the Rhodesian producers. Meantime the price of copper has reached new high levels and prices of producers' shares are moving up with the metal. It would be a great pity if this position were allowed to continue. A prolonged differentiation of the price between London and the rest of the world might play havoc with our exports by pricing them out of the market.

In giving final take-over terms of Vulcan Foundry and Robert Stephenson, English Electric forecast a 12½% dividend for the year. Final payment is to be 8½% compared with 6¾% which followed the 50% scrip issue in mid-1953. This proved a little disappointing as, unless profits have advanced substantially, the new dividend will be covered not much more than twice over. But the company, with its new locomotive equipment, should be in a position to accept a great deal of business under the new railway programme.

Later in the week, G.E.C. announced an interim dividend of 4½% compared with 3¾%. For recent buyers in the market the announcement was spoilt by the directors' statement that shareholders should not expect any change in the 12½% total for the year. We have heard these statements before but in the case of G.E.C. the caution is probably justified, especially as there are only two months of the current financial year to go.

Sir Edward Wilshaw does well to be able to report a 20% increase in gross income, for Cables & Wireless (Holding). The company is now an industrial trust and the result is impressive even in a year when dividends were on the upgrade. Gross revenue was £744,000 for 1944 against £583,000 for 1953. Net profits are higher by £82,000 at £399,000. Shareholders get £55,000 of this increase. Sir Edward has wisely concentrated on commercial and industrial stocks in this time of rising equities.

A feature of the company's interests is that about 20% of its total investments are unquoted. This probably means that they are being nursed until they grow up, when the company will receive comparable benefits from higher capitalisation when the companies are marketed. Company's units are now quoted as £1 shares instead of the former £100 in order to make it easier for small investors to take an interest. Price is now 47s., and with the final dividend of 7% the yield is about 4½%.—*From our City Correspondent.*

Aberdare Cables (Holdings) Ltd.

The Board announces that the offer to acquire 599,996 5s. shares in South Wales Switchgear Ltd., and 134,700 £1 shares in Aberdare Engineering Ltd., has received 100% approval by shareholders of both companies. Renounceable allotment letters can be received free of stamp duty up to 11 Mar.

Associated Electrical Industries Ltd.

The offer of A.E.I. to acquire the £2,981,850 Ordinary stock of Siemens Brothers and Co., Ltd., not already owned by A.E.I., has been accepted by holders of more than 90% of the Ordinary stock, it is stated.

H. J. Baldwin and Co. Ltd.

This concern has made a further bid for the issued capital of Railway and General Engineering Co. Five Shillings is now offered for each of the 750,000 Ordinary 2s. shares and 25s. for each of the 25,000 5½% Preference £1 shares. Shareholders are advised by the board not to dispose of their holdings.

A previous offer, 4s. and 20s. a share respectively, was not recommended by the Railway and General board for acceptance by shareholders; it lapsed last Dec.

Cable and Wireless (Holding)

A final dividend of 7% makes a total of 10% on capital increased by a 10% free scrip issue. The previous year the total was 9%. Group earnings for 1954 amount to £399,000 compared with £317,367 a year earlier. That figure is arrived at after charging taxation of £345,000 (*£265,782*).

English Electric Co. Ltd.

Recommending a final dividend of 8½% to raise the year's total from the equivalent to 9½% to 12½%, the directors state that the increase is proposed having regard to the negotiations with Vulcan Foundry and Robert Stephenson, and in the light of provisional figures for 1954.

General Electric Co. Ltd.

Announcing an interim dividend of 4½%—an increase of ¼%—the directors state that they expect to be able to recommend a final dividend of 8%, which will again make the total for the year 12½%.

Hilger and Watts Ltd.

The dividend for the year ended 30 Sept. last is raised by 1½% to a total of 9%. Profit for the year is £37,730 (*£28,634*).

Lindley Thompson Transformer (Holdings) Ltd.

Despite the general fall in prices of finished goods, due to severe competition in the home as well as the export market, turnover in quantity of goods produced last year increased by over 10%, Mr J. Lindley Thompson, the chairman, reports. The prospects for the next financial year are difficult to forecast due to the further labour demands now under consideration, and the erratic price movement of copper. As compared with last year there does appear to be a greater demand for the firm's type of product. The coming year has been commenced with a satisfactory order book which has grown during the first three months of this year, he adds. Certain capital expenditure will be involved this year for replacement of plant and the introduction of new equipment.

Year to 30 Sept.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1952	66,165	22,677	16	12½	1/3	10d.
1953	87,660	37,014	26	12½	1/3	11d.
1954	100,471	46,388	32	12½	1/4	10d.

R. A. Lister and Co. Ltd.

The year ended 30 Sept. last (figures for which we reported last week) saw a record turnover and profits, before taxation. Sir Percy Lister, the chairman, states that widespread export connections and goodwill produced record demands for the products of the group during the year. This trend currently continues, he says, and the steady expansion of the group's activities should stand the firm in good stead if and when less favourable world trading conditions pertain. An improvement in the trading conditions in Australia has reflected itself in the more recent returns of the Australian subsidiary. He believes that that improvement should be maintained.

John Thompson

Treasury consent has been obtained for a three-for-five scrip issue. Holders of the new shares will be entitled to the final dividend for 1954 in which connection the directors suggest that a final of 10% would appear to be justified. The directors estimate that the group turnover for 1954 should exceed by more than £1 million the 1953 figure of nearly £14½ millions and that the gross group profit, before taxation, depreciation, etc., should show an increase of at least 7½% over that for 1953. The group work in hand will show a reduction from the previous record figure due mainly to the increased output last year, but, it is stated, should still provide work for more than two years ahead.

Dividend Declared

Berry Wiggins and Co. Second interim of 7½%.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

4 Feb.—Cardiff. Cables, lamps and fittings for Hospital Management Committee in year from 1 Apr.—See 20 Jan. issue.

4 Feb.—Chester-le-Street R.D.C. Fittings, conduit, cable, etc. for 134 houses at Lumley, Sacriston and Pelton.—See 20 Jan. issue.

4 Feb.—Stretford T.C. Steel poles, lanterns, timeswitches, etc., for street lighting in Chester Rd.—See 27 Jan. issue.

4 Feb.—Wigan T.C. Wiring of shops and flats on Smethurst Lane estate.—See 27 Jan. issue.

5 Feb.—Caerphilly U.D.C. Group A standards with 140 W sodium lamps, lanterns, etc. along A.469.—See 20 Jan. issue.

5 Feb.—Consett U.D.C. Lamps for street lighting in year from 1 Apr.—See 13 Jan. issue.

5 Feb.—Herne Bay U.D.C. Overhead distribution network to caravan sites at Reculver.—See 27 Jan. issue.

5 Feb.—Merthyr Tydfil T.C. Electrical goods in year from 1 Apr.—See 27 Jan. issue.

5 Feb.—Mitcham T.C. Lamps in year from 1 Apr.—See 27 Jan. issue.

5 Feb.—Ryton U.D.C. Lighting and heating in 58 houses at Crawcrook.—See 20 Jan. issue.

5 Feb.—Swansea T.C. Lamps, steel and concrete pillars and lighting equipment in year from 1 Apr.—Advertised in 30 Dec. issue.

7 Feb.—Coventry T.C. Supply of electrical equipment in year from 1 Apr. City Engineer, Council Hse.—Advertised in this issue.

7 Feb.—Dundee T.C. Poles, lanterns, etc. for street lighting.—See 20 Jan. issue.

7 Feb.—Farnworth T.C. Lighting in 45 flats on Albert Rd site.—See 27 Jan. issue.

7 Feb.—Rowley Regis T.C. Supply of electricians' requisites.—See 27 Jan. issue.

7 Feb.—Spenborough U.D.C. Group A sodium street lighting along A.26.—See 27 Jan. issue.

7 Feb.—Stoke-on-Trent T.C. Lamps during six months from 1 Apr.—See 20 Jan. issue.

7 Feb.—Warrington T.C. Concrete columns in year from 1 Apr.—See 20 Jan. issue.

7 Feb.—West Fife. Maintenance work in year from 1 Apr, in hospitals.—See 27 Jan. issue.

7 Feb.—Winchester. Electric lamps for 14 hospitals in year from 1 Apr.—See 20 Jan. issue.

7 Feb.—Wortley R.D.C. Installation in 206 houses at Chapeltown.—See 27 Jan. issue.

8 Feb.—Witney (Oxon) U.D.C. Group A lighting for trunk road A.40.—See 27 Jan. issue.

9 Feb.—Durham. Lamps for Durham Hospital Management Committee.—See 27 Jan. issue.

9 Feb.—Newark-on-Trent T.C. Rewiring and installation at town hall.—Advertised in 13 Jan. issue.

10 Feb.—Enfield. Supply of electric lamps in year from 1 Apr, for Group Hospital Management Committee. Supplies Officer, Chase Farm Hospital.

10 Feb.—Londonderry T.C. Various electrical goods.—See 27 Jan. issue.

10 Feb.—Manchester T.C. Installation in home for aged at Garton.—See 20 Jan. issue.

10 Feb.—Metropolitan Water Board. Lamps required in year from 1 Apr.—See 27 Jan. issue.

11 Feb.—Edinburgh T.C. Installation in 146 houses in Charmiston North development.—See 27 Jan. issue.

11 Feb.—Leeds T.C. Power factor correction equipment at Knoskop sewage works.—Advertised in 27 Jan. issue.

11 Feb.—Macclesfield. Lamps and fittings in year from 1 July for Hospital Management Committee.—See 27 Jan. issue.

11 Feb.—Walsall T.C. Supply of lamps in year from 1 Apr. R. E. Goakes, chief welfare officer, 29 Leicester St.

12 Feb.—Northumberland. Electrical work in adaption of air-raid warning sirens at police stations at Alnwick, Amble, Morpeth and Wooler. County Surveyor, Phoenix Hse, Queen St, Newcastle.

12 Feb.—Wembley T.C. Pedestrian controlled trucks.—See 20 Jan. issue.

14 Feb.—Darlington T.C. Improved street lighting along North Rd (A.1) —Advertised in 20 Jan. issue.

14 Feb.—Hawick T.C. Steel standards and mercury vapour lighting equipment along trunk road A.7.—See 13 Jan. issue.

14 Feb.—Huntingdon T.C. Electrical plant in pumping stations.—See 6 Jan. issue.

14 Feb.—King's Lynn T.C. Lamps and electrical sundries in year from 1 Apr.—See 27 Jan. issue.

14 Feb.—Norwich T.C. Supply of electric lamps in year from 1 Apr. H. C. Rowley, City Engineer, City Hall.

14 Feb.—Poole T.C. Supply of electric lamps, wiring supplies and accessories, water heaters, street lighting lanterns and concrete columns. J. Barron, Borough Engineer and Surveyor, Municipal Buildings.

14 Feb.—Rainhill P.C. Supply, erection of sodium vapour discharge lighting units on Liverpool-Warrington trunk road A.57. Clerk to Parish Council, 124 St Helens Rd, Prescot, Lancs. Deposit £2. 2s. —Advertised in this issue.

14 Feb.—Royton U.D.C. Supply of lamps in year from 1 Apr. L. Cookson, Engineer and Surveyor, Town Hall.

15 Feb.—Belper U.D.C. Six sewage pumping sets.—See 30 Dec. issue.

16 Feb.—Belfast T.C. Renewal of installation at Whitla St fire station. Fire Brigade H.Q., Chichester St. Deposit £2. 2s.

16 Feb.—Keynsham U.D.C. Equipment and wiring for lighting A.4 Bath Rd at Saltford.—Advertised in 27 Jan. issue.

18 Feb.—Basingstoke T.C. Installation of group A fluorescent lighting on steel columns along about 1,475 yd of trunk road. W. G. A. Clark, borough surveyor, Municipal Buildings. Deposit £2. 2s.—Advertised in this issue.

18 Feb.—Hemel Hempstead T.C. Supply of electric lamps in fiscal year 1955-56. A. H. Turner, Borough Engineer, Market Sq.

18 Feb.—Manchester T.C. Electrical engineering equipment required for Openshaw College of Further Education. Education Committee, Stores Dept., Chaddeston St, New Cross.

18 Feb.—Wembley T.C. Conversion of street lighting from gas to sodium vapour discharge lighting.—Advertised in 27 Jan. issue.

18 Feb.—Whickham (Dur.) U.D.C. Electrical materials in year from 1 Apr.—See 27 Jan. issue.

19 Feb.—N. Ireland. Supply of lamps required by Purdysburn Hospital Management Committee in year from 1 Apr. Secretary of Committee, Saintfield Rd, Belfast.

19 Feb.—Stanley U.D.C. Group A 400 W mercury vapour lamps, lanterns and control gear, and concrete columns, for Bradford Rd, A650.—See 20 Jan. issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 131 queries answered this week

"Rothermel" bedwarmers, address for spares? S.B.—N.S.F. Ltd., Ingrow Bridge Works, Keighley, Yorks.

"Prestik" compound for use with bulkhead fittings, makers of? A.W.—B.B. Chemical Co., Ltd., Ulverscroft Works, Ulverscroft Rd, Leicester.

"Clifton" recorders, makers of? T.E.—Bristol Magnetic Recorders Ltd., 11 Alma Vale Rd, Bristol.

"Wynates" lighting fittings, makers of? W.W.—Brian Wynates Smith, 99/101 New Sumner St, Birmingham 19.

"Tower" brand aluminium ware, makers of? S.E.—Midland Metal Spinning Co., Ltd., Pelham St, Wolverhampton.

"Genyk" conduit fittings, makers of? D.E.—Hygienic Wire Works Ltd., Miles Rd, Mitcham, Surrey.

"Thermalux" blankets, makers of? E.M.B.—Thermalux Electrical Products Ltd., Talbot Works, Lewis St, Halifax, Yorks.

"Aristocrat" fittings, makers of? H.B.—Allen and Pope Ltd., 14 Shacklewell Lane, E.8.

21 Feb.—Newark-on-Trent T.C. Supply and erection of 18 MV lamps on steel columns and 64 filament lamps on concrete columns. Borough Surveyor, Municipal Buildings. Deposit £2. 2s.—Advertised in this issue.

21 Feb.—Tynemouth T.C. Lamps and cable, columns, lanterns and fittings, and household accessories in year from 1 Apr.—See 27 Jan. issue.

22 Feb.—Preston T.C. Installation at Ribbleton Hall school.—See 13 Jan. issue.

23 Feb.—Luton T.C. Electrical installation at Beach Hill, Tennyson Rd and Maidenhall School canteens. Borough Engineer, Town Hall. Deposit £2. 2s. in each case.

24 Feb.—Brigg U.D.C. Installation of 65 class A street lighting units on concrete columns and wall brackets. T. Spurr, Engineer and Surveyor, Riverside East. Deposit £2. 2s.—Advertised in this issue.

25 Feb.—Belfast T.C. Supply of medium voltage sub-station distribution board. Tender No. W.64. Electricity Dept., East Bridge St.—Advertised in this issue.

26 Feb.—Dagenham T.C. Supply and erection of 40 group A street lighting units in Ballards Rd. Borough Engineer and Surveyor, Civic Centre.

26 Feb.—Irlam U.D.C. Supply of lamps in year from 1 Apr. Engineer and Surveyor, Council Offices, Irlam, near Manchester.

26 Feb.—Stockport T.C. Laboratory equipment for Stockport College.—See 20 Jan. issue.

28 Feb.—Dewsbury T.C. Street lighting equipment.—Advertised in 27 Jan. issue.

28 Feb.—Harrogate T.C. Supply of lamps in year from 1 Apr. C. E. Fellows, Borough Engineer, Municipal Offices.

28 Feb.—Co. Kildare. Rewiring of hospital at Naas.—See 27 Jan. issue.

28 Feb.—Westhoughton U.D.C. Supply of electric lamps in year from 1 Apr. F. H. Walker, Surveyor, Town Hall.

2 Mar.—N. Ireland. Electrical installation for new geriatric unit at Belfast City Hospital. Chief Engineer of N.I. Hospitals Authority, 44-46 Queen St. Deposit £3. 3s.

4 Mar.—Chatteris (Isle of Ely) U.D.C. Supply and erection of concrete and steel lighting columns, conversion of existing columns from gas to electricity, and supply of equipment for 250 W, 125 W and 80 W mercury vapour and 150 W tungsten lighting. D. Charlesworth, engineer and surveyor, Grove Hse. Deposit £2. 2s.

5 Mar.—Co. Mayo. Sewage pumping plant in Kiltimagh sewerage scheme.—See 20 Jan. issue.

7 Mar.—Stepney B.C. Electrical installation in block 1 to 4 of flats in Sidney St scheme. Sydney Clough, Son and Partners, Devonshire Close, 39 Devonshire St, W.1. Deposit £2. 2s.—Advertised in this issue.

9 Mar.—Sunderland R.D.C. 12 months' supply of goods, housing maintenance programme.—See 27 Jan. issue.

12 Mar.—Airdrie T.C. Supply of electric lamps in year from 16 May. Town Clerk, Airdrie.

31 Mar.—Belfast T.C. Central evaporating plant.—Advertised in 27 Jan. issue.

No date stated.—Angus. Supply and installation of two electrically driven centrifugal pumps, each capable of 86 g.p.m. County Engineer, County Buildings, Forfar.

No date stated.—N. of Scotland H.E. Board. 33 kV wood pole o.h. line between Arbroath and Bridge of Dun.—Advertised in 27 Jan. issue.

No date stated.—Penrith U.D.C. Group A street lighting columns, fluorescent and sodium lanterns, etc.—See 27 Jan. issue.

No date stated—N. of Scotland H.E. Board. Supply and installation of 660 V power and auxiliary cables between Clunie 132 kV sub-station and power station. Kennedy and Donkin, engineers, 12 Caxton St, London, S.W.1. Deposit £2. 2s.—Advertised in this issue.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 1 February

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	321	+7	226½
,, (3 months)	302	+4½	214½
LEAD, refined pig, min. 99·97% purity (cash)	105½	+1	85½
,, (3 months)	105½	+1½	84
TIN, refined, min. 99·75% purity (settlement)	714	+6½	655
,, (3 months)	715	+6	635
ALUMINIUM, ingots 99-99·5%	163	—	156
ZINC, virgin, min. 98% purity (cash)	90½	+3½	72½
,, (3 months)	89	+3½	71
RUBBER No. 1, RSS. spot (per lb.)	30½d.	−⅛d.	16⅛d.
,, c.i.f. basis, ports. Apr. (per lb.)	29½d.	−⅛d.	16⅛d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52½	—	51½
Mild Steel Tape (0·014 in.)	40½	—	40

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

28 Feb.—Australia. Electricity Commission of N.S.W. requires supply of eighteen 5 MVA 66/11 kV power transformers with necessary equipment. Tender No. 399. Commission's Secretary, Box 5257, G.P.O., Sydney. B.o.T. (Ref.: ESB 1307/55).*

2 Mar.—Egypt. Supply of total of 35,200 W hour meters required by Cairo Electricity and Gas Administration, 53 Fouad el Awal St, Cairo. B.o.T. (Ref.: ESB 1387/55).*

3 Mar.—Uruguay. Tenders (No. 2349 specification 4144/55) invited by Administracion General de las Usinas Electricas y los Telefonos del Estada, for various electric power meters. B.o.T. (Ref. ESB 1476/55).*

4 Mar.—New Zealand. Supply of total of 7,000 yd of 4-core l.t. cable for Auckland, Electric Power Board, Queen St. B.o.T. (Ref.: ESB 1487/55).*

14 Mar.—India. Supply of one 56,000 b.h.p. Kaplan turbine and one 47,060 kVA synchronous general for Panchet Hill hydroelectric power station. Deputy Chief Electrical Engineer, Damodar Valley Corpn., Anderson Hse, Alipore, Calcutta 27. B.o.T. (Ref.: ESB 282/55).*

28 Mar.—Malaya. Tenders invited by the Municipality of Kuala Lumpur for supply and erection of two 200 kW dual-fuel engine driven electric generators, switchboard and auxiliary plant for sewage pumping station. Documents from J. D. and D. M. Watson, 18 Queen Anne's Gate, Westminster, S.W.1. Deposit £5. 5s.

29 Mar.—New Zealand. State Hydro-Electric Dept. invite tenders for two sets of 33 kV outdoor switchgear. Both comprise two 800 A airbreak switches, 33 600 A airbreak switches, three 800 A and 26 600 A double underhung disconnecting switches, three 3-phase sets busbar supports, four 3-phase sets horizontal fuse mountings with fuses and eight sets of spares. B.o.T. (Refs.: ESB 30181/54 and ESB 30229/54).*

2 Apr.—Egypt. Director General Mechanical and Electrical Dept., Min. of Works, Cairo, invites tenders for supply, erection, etc., of Middle Egypt Electrification Scheme and Aboul Menaga Electric Pumping Station Extension. B.o.T. (Ref.: ESB 1093/55).*

7 Apr.—Egypt. Supply and erection of complete self-contained power station at El Tabbin to be connected to Cairo 63kV grid now being installed. Max. continuous rating of each of the three turbo-alternator sets will be 15,000 kW. Tenders invited by Egypt's Ministry of Public Works. B.o.T. (Ref.: ESB 1405/55).*

13 Apr.—Kuwait. Supply, erection of 33 kV aluminium conductor wood pole o.h. lines for new transmission system. Tender No. 5305/E2. President of Department of Electricity, Govt. of Kuwait.—Advertised in 27 Jan. and this issue.

18 Apr.—Portuguese E. Africa. Ports, Railways and Transport Dept. invite tenders for supply of 109 items of electrical equipment, including lamps, insulating material, 230/500 W TGI turbo-generators, fusible switches, etc. B.o.T. (Ref.: ESB 1060/55).*

9 May—India. Supply, erection of five 3-ton electric portal cranes, for Commissioners for Port of Calcutta. Documents from Rendel, Palmer and Tritton, 125 Victoria St, London, S.W.1, at £3 per set.

Contracts Placed

B.E.A. 3,300 volt indoor airbreak auxiliary switchgear at Castle Donington, British Thomson-Houston Co., Ltd. One 125 MVA 13·8/295 kV generator transformer at Drakelow B, British Thomson-Houston Co., Ltd. Twelve auxiliary transformers at Willington A, Yorkshire Electric Transformer Co., Ltd., and four booster and four boiler feed pumps at same, Mather and Platt, Ltd. Two natural draught cooling towers at Wakefield, Davenport Engineering Co., Ltd. Nine 10 MVA 132/3·3 kV transformers at Capenhurst sub-station, Ferranti Ltd. One 752MVA 133/66 kV main and one 140 kVA auxiliary transformers at Dunston substation, Ferranti Ltd.; and 132 kV overhead line, Rochdale-Kearsley-Rawtenstall, W. T. Henley's Telegraph Works Co., Ltd.

Ennerdale (Cumb) R.D.C. Internal wiring of 206 houses at Egremont, J. E. Lovell, £6,035.

London. Renewal and improvement of installation at Poplar Technical College. Johnson Smith and Co. Ltd., £11,581.

Middlesbrough T.C. Street lighting in Park End Development, N.E. Electricity Board, £4,800.

BUSINESS PROSPECTS

Home

Alnwick U.D.C. Plans provisionally approved for erection of 66 houses on Greenfield Ave estate.

Argyll. Approval granted for erection of 66 houses at Strachur, 4 at Braeside, and 10 houses at Inveraray.

Barnsley T.C. Construction of secondary modern school at Kendray. H. A. Redburn, Director of Education, Education Dept., Town Hall.

Brighton T.C. Tenders may soon be invited for erection of 14 bungalows on Manor Paddock estate, and 133 houses, 12 flats, 4 shops, etc., on North Woodingdean estate.

Brownhills (Staffs). U.D.C. to build 51 houses on Salters Rd site, Walsall Wood, and 50 on Norton Canes and Central Ward sites.

Bury T.C. Erection of Brandlesholme county primary school. Borough Engineer, Town Hall.

Carlisle. Metal Box Co. Ltd., London, W.1, negotiating for site at Botcherby for erection of factory which is estimated to cost £700,000. Also additions costing £63,000 planned at girls' high school.

Chapel-en-le-Frith R.D.C. Construction of 28 houses at Hayfield and 8 at Buxworth. Engineer and Surveyor, Council Offices, Hayfield Rd.

Chesterfield. Secondary school to be built on site off High St between Old Whittington and New Whittington at cost of about £220,000. Also, new £72,000 fire station to be built in Sheffield Rd, Whittington Moor.

Co. Offaly (Eire). Erection of 28 houses in Athlone Rd., Ferbane. A. Edward Smith and Co., quantity surveyors, 4 Wilton Place, Dublin.

Cornwall. County branch of N.F.U. is planning to build £400,000 factory at Doublebois. Union is at Agriculture Hse, Strangeways Terr, Truro.

Daventry (Northants) R.D.C. Twenty dwellings to be built at Crick and 16 each at Long Buckby and Weedon.

Doncaster T.C. Erection of technical high school for boys in Armthorpe Rd. Borough Architect's Office, 15 South Parade.

Dover T.C. Erection of 30 flats, four maisonnettes, public house, showrooms and shops at Stembrook. Borough Engineer, Brook Hse, Maison Dieu Rd.

East Grinstead U.D.C. Erection of 2-storey block of flatlets at Charlwoods Row. B. J. Cornelius, Surveyor to Council, East Court.

Felling (Dur). Grand Cinema Ltd. propose to build cinema on Leam Lane housing site.

Glasgow. New 14-storey building to be built fronting Argyle and Queen Sts for Littlewoods Mail Order Stores Ltd. Cost estimated at £900,000.

Goole T.C. Approval in principle given to scheme for installing electricity in older council houses on request.

Guisborough U.D.C. Loan sanction for £82,350 sought for erection of 56 houses at Lazenby.

Halesowen. Factory to be erected in Lodgefield Rd for Midland Chair-Frame Manufacturing Co., Ltd., Bromsgrove Rd.

Halifax. Erection of St. Thomas More's R.C. secondary school off Holdsworth Rd, Holmfield. J. H. Langtry-Langton, architect and surveyor, 8 Oak Mount, Bradford.

Hebburn-on-Tyne U.D.C. There are long term plans for shopping centre in Station Rd area which is expected to comprise about 40 shops and cost about £300,000.

Hexham (Northumb) U.D.C. Plans approved for additions to Queen Elizabeth grammar school for boys.

Huddersfield T.C. Construction of secondary modern school at Deighton. Borough Architect, High St Buildings.

Liverpool T.C. Construction of Beechwood day special school at Aigburth, secondary school for girls at Princes Park, and county primary school at Woolton. City Architect, Blackburn Chambers, Dale St.

London. Thomas Rd, E.14, is site for Mazawattee Tea Co. Ltd.'s proposed £50,000 factory. L. Smith and Waters of 103 Old Brompton Rd, S.W.7, are architects. Also, W. Fearnehough Ltd. are to build offices and workshops in Trundley's Rd, S.E.8, for which Adams, Holden and Pearson, 2 Gordon Sq, W.C.1, are architects.

Melksham U.D.C. Erection of 45 houses on Lambourne Farm estate. Engineer and Surveyor, Town Hall.

Mexborough U.D.C. Erection of 106 dwellings on Highwoods estate. Architect and Surveyor, Council Offices, Adwick Rd.

Portmadoc (Caerns). Planning approval granted for erection of 318 houses, 54 bungalows, 10 shops, church, etc., on Black Rock Sands estate, Morfa Bychan, for L. Bullivant, architect, Dove Hse Farm, Solihull. (By-law approval not yet granted.)

Ramsbottom U.D.C. Construction of 44 houses and 24 maisonnettes on Tagg Wood estate. Engineer and Surveyor, Council Offices.

Reading. Offices and workshops to be built by Thames Conservancy Bd. at cost of about £183,000. Architects are Waterhouse and Ripley, Staple Inn Buildings, High Holborn, London, W.C.1.

Sedgefield R.D.C. Construction of 78 houses and 8 bungalows at Chilton Buildings, and 44 houses at Trimdon Village. Housing Architect, Council offices.

Sheffield T.C. Erection of Newfield secondary modern school for boys at Norton. J. L. Womersley, City Architect, Town Hall.

Southampton T.C. Construction of junior and infants' school at Thornhill. Borough Architect, Civic Centre.

Wallsend T.C. Erection of 48 dwellings on Low Willington Farm estate. Borough Surveyor, Town Hall.

Warrington T.C. Erection of new boys' and girls' secondary schools at Orford. Borough Surveyor, Town Hall.

West Hartlepool. Erection of St. Joseph's R.C. primary school in Musgrave St. T. A. Crawford, 80 Borough Rd, Middlesbrough.

Overseas

Egypt. Mr J. Abourbih, managing director of J. Abourbih and Co., 9 Kasr el Nil St, Cairo, wishes to contact U.K. manufacturers of (among other items) washing machines.

U.S.A. Quotations from U.K. makers of rectifier tubes and switches sought by the J. E. Berger Corporation, 4550 Maybury Grand Ave, Detroit 8, who build electric power equipment, transformers and control panels.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Rover. 734,347. Class 9. Wireless, telephonic instruments, etc. Regentone Radio and Television Ltd., Eastern Ave., Romford, Essex.

Tele-Aquarium. 735,408. Class 11. Lampshades. Products K Blackpool, 51 Adelaide St, South Shore, Blackpool.

Thermoit. 712,278. Class 9. Elements, connections, irons, etc. Metway Electrical Industries Ltd., Metway Works, Canning St, Kemp Town, Brighton.

Therminol. 735,413. Class 9. Capacitors. A. H. Hunt (Capacitors) Ltd., Bendon Valley, Garratt Lane, S.W.18.

Qualtape. 735,437. Class 9. Apparatus employing tape for recording, etc. Electronic Service Co., 93/95 Button Lane, Sheffield 3.

Pedigree. 730,046. Class 7. Power operated hair clipping machines (not for personal use). Wolseley Sheep Shearing Machine Co., Ltd., Electric Ave, Wilton, Birmingham 6.

Adamaid. 733,257. Class 7. Automatic dish washing machines. Ajax Domestic Appliance Co., Ltd., West Mount Works, Johnson St, Halifax.

Silver Circle Brand. In design. 732,623. Class 9. Signal lanterns, dark room lamps, etc. 732,626. Class 17. Insulating materials, etc. Geo. Cohen, Sons and Co., Ltd., Broadway Chambers, Hammersmith, W.6.

Gazette Announcements

COMPANIES ACTS

Caton's Metal Productions Ltd. Last day for receiving proofs in respect of intended payment to preferential creditors, 9 Feb. Liquidator is R. K. Clark, Official Receiver, Somerset Hse, 37 Temple St, Birmingham.

Central Refrigeration Ltd. Meetings of members and creditors will take place at offices of Alfred Tooke and Co., 8 Salisbury Sq, Fleet St, E.C.4, on 2 Mar, at 3 p.m. and 3.30 p.m. respectively to receive liquidator's report.

J. and F. Lewis Lighting and Radio Ltd. J. M. Clarke, Senior Official Receiver and Liquidator, of Inveresk Hse, Strand, W.C.2, released as from 14 Jan.

Clowne Electric Supply Co., Ltd. Members have appointed E. R. Birley of 17 Gluman Gate, Chesterfield, as liquidator in place of James Gadsby, deceased.

BANKRUPTCY ACTS

Receiving Order

Shrewsbury. Herbert J. Gornall, electrical engineer trading at 12 Fish St, Shrewsbury. Receiving order dated 18 Jan.

Release of Trustee

London. Leonard McCourt, electrical wire merchant trading as B. Doyle at 157 High Holborn, W.C.1. Trustee was F. H. Langmaid, Official Receiver, Bankruptcy Buildings, Carey St, W.C.2.

Dividends

London, George A. Watts, electrical engineer trading as Watts and Watts at 185 Stockwell Rd, and 32 Moat Place, Stockwell, S.W.9. First and final dividends of 2s. in £ payable on 7 Feb. at offices of A. E. Attwood at 20-21 Lawrence Lane, Cheapside, E.C.2.

MEETINGS TO NOTE

THURSDAY, 3 FEB.

I.E.E. (London). "Criterion of Distribution Cost," D. J. Bolton. Savoy Place, W.C.2, 5.30 p.m.

I.E.S. (Cardiff). "Outdoor Illuminations," H. Carpenter. Elect. Offices, The Hayes, 5.45 p.m.

I.E.S. (Glasgow). "Studies in Interior Lighting," J. M. Waldram. 39 Elmbank Cresc, 7.30 p.m.

I.E.S. (Nottingham). "Lighting for Sport," M. W. Peirce. Elect. Offices, Smithy Row, 6 p.m.

A.S.E.E. (S. London). "Atomic Energy," Dr Hughes. Cafe Royal, North End, Croydon, 8 p.m.

CHELMSFORD ENGRNG. SOC. "Some Applications of Prestressed Concrete," F. Webster, Hoffmann's Social Hall, 7.30 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Merseyside). "Colour TV—Prospects and Problems in U.K.," D. W. Heightman. College of Tech., Byrom St, Liverpool, 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (N. Western). "Recent Developments in Test Gear in Radio, TV, and Radar Fields," A. G. Wray. College of Tech., Sackville St, Manchester, 7 p.m.

CHIEF TECH. ASSISTANTS' ASSOC. "Impressions from U.S.A." L. H. Welch. 2 Savoy Hill, London, W.C.2, 6.30 p.m.

FRIDAY, 4 FEB.

I.E.E. (N. Eastern). "Design, Performance and Application of Miniature Circuit-Breakers," H. W. Wolff and T. G. F. Atherton. Workington Tech. College, 7 p.m.

I.E.E. (N.W. Utilisation). Dinner dance at Lesser Free Trade Hall, Peter St, Manchester, 7 p.m.

I.E.E. (S. Midland). Annual dinner at Grand Hotel, Birmingham.

I.E.E. (Swansea). Annual dinner and dance.

A.S.E.E. (N.W. London). Technical Films by P. A. Thorogood. Century Hotel, Forty Ave, Wembley Park, 8.15 p.m.

A.S.E.E. (Liverpool). "Electronics in Industry," A. Williams. Liverpool Engrng. Soc., 24 Dale St, 7.30 p.m.

INST. OF FUEL (S. Wales). "Smoke Abatement," Dr A. C. Monkhouse. S. Wales Inst. of Engineers, Park Place, Cardiff, 6 p.m.

A.S.E.E. (Bristol) "Mineral Insulated Cables," R. W. Sutherland. Grand Hotel, 8 p.m.

MONDAY, 7 FEB.

I.E.E. (London). Discussion on "Problem of Radio Interference," C. W. Sawton. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N.E. Radio and Measurements). "Radio Aids to Marine Navigation," Capt. F. J. Wylie, R.N. (Retd.). King's College, Newcastle, 6.15 p.m.

I.E.E. (S. Midland). "District Heating," J. Armstrong; "Modern Electrical Methods of Balancing Machines," E. P. Fowler; "Planetary Mill and its Drive," J. T. Jones. James Watt Inst., Great Charles St, Birmingham, 6 p.m.

I.E.E. (S. Midland). "Future of Electronics in Industry," E. R. Davies. Winter Garden Restaurant, Gt. Malvern, 7.15 p.m.

I.E.E. (Western). "Aluminium-Sheathed Cables," P. M. Hollingsworth. Electricity Hse, Colston Ave, Bristol, 6 p.m.

I.E.E. (Irish). Annual dance at Gresham Hotel.

I.E.E. (Hatfield). "Ferrite Frequency Modulator," F. Slater. Film on "Industrial Applications of Ultrasonics." Tech. College, 7 p.m.

I.E.E. (Maidstone). "British Atomic Factories," J. B. Jay. Wig and Gown Hotel, 7.30 p.m.

N. EAST ELECTRIC CLUB. "Electrical Equipment in Works Canteens," A. L. Mitchell. Liberal Club, 98 Pilgrim St, Newcastle, 6.30 p.m.

ROCHDALE ELECT. TRADES TECH. SOC. "Electrical Installation of Aircraft," R. J. C. Tarn. Electric Hse, Smith St, 7.45 p.m.

SOC. OF ENGRS. Presidential address by Dr H. G. Taylor. Geological Soc., Burlington Hse, W.1, 5.30 p.m.

A.S.E.E. (N.E. London). "Electricity in Horticulture," F. E. Rowland. Angel Hotel, Ilford, 8 p.m.

A.S.E.E. (Leeds). Films loaned by American Embassy. Great Northern Hotel, 7.30 p.m.

TUESDAY, 8 FEB.

I.E.E. (E. Midland). "Social Implications of Electrical Engineer," H. L. Haslegrave. Elect. Showrooms, Derby, 6.30 p.m.

I.E.E. (N.W. Supply). "Problems of Hydro-Electric Design in Mixed Thermal-Hydro-Electric Systems," T. G. N. Haldane and P. L. Blackstone. Engrs.' Club, Albert Sq, Manchester, 6.15 p.m.

I.E.E. (N. Ireland). "Safety in Use of Portable and Transportable Electrical Equipment in Industry," J. W. Bunting. Queen's Univ., Belfast, 6.30 p.m.

I.E.E. (Western). Faraday lecture: "Courier to Carrier in Communications," T. B. D. Terroni. Brangwyn Hall, Swansea, 6.30 p.m.

I.E.S. (London). "Lighting of Hazardous and Corrosive Locations in Industrial Plants," A. G. Palmer and W. E. Harper. 2 Savoy Hill, W.C.2, 6 p.m.

INSTN. OF ENGRNG. INSPECTION (S. Western). "History and Manufacture of Electric Lamps," A. W. Gostt. Grand Hotel, Bristol, 7.30 p.m.

ELECT. INDUSTRIES CLUB. Monthly luncheon.

WEDNESDAY, 9 FEB.

I.E.E. (London Radio). "Study of Commercial Time Lost on Transatlantic Radio Circuits due to Disturbed Ionospheric Conditions," J. K. S. Jowett and G. O. Evans; "Performance Characteristics of High Frequency Radio Telegraph Circuits," A. M. Humby, C. M. Minnis and R. J. Hitchcock. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. of Scotland). "Possibilities of Cross-Channel Power Link between British and French Supply Systems," D. P. Sayers, M. E. Laborde and F. J. Lane. Caledonian Hotel, Aberdeen, 7.30 p.m.

I.E.E. (Southern). "Criterion of Distribution Cost," D. J. Bolton. Brighton Tech. College, 6.30 p.m.

I.E.E. (Oxford). "Fault Location in Supply Industry," T. David. Elect. Showrooms, George St, p.m.

BELFAST ASSOC. OF ENGINEERS. "History and Development of Mine Ventilation," L. Irwin. College of Technology, 7.30 p.m.

BRITISH INSTN. OF RADIO ENGRS. (N. Eastern). Students' papers at Neville Hall, Westgate Rd, Newcastle, 6 p.m.

BRITISH INSTN. OF RADIO ENGRS. (W. Midlands). "Electronic Motor Control Systems," J. C. Rankin. Tech. College, Wulfruna St, Wolverhampton, 7.15 p.m.

A.S.E.E. (Birmingham). "Electricity in Horticulture," M. M. Harvey. Chamber of Commerce, New St, 7.15 p.m.

A.S.E.E. (Bradford). "Medium Voltage Switchgear," R. T. Lythall, Midland Hotel, 7.30 p.m.

A.S.E.E. (York). "Industrial Lighting," R. Pye. Picture House Cafe, Coney St, 7.15 p.m.

THURSDAY, 10 FEB.

I.E.E. (London). "Maintenance Principles for Automatic Telephone Exchange Plant," R. W. Palmer. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. of Scotland). "Possibilities of Cross-Channel Power Link between British and French Supply Systems," F. J. Lane, M. E. Laborde and D. P. Sayers. Queen's College, Dundee, 7 p.m.

I.E.E. (Western). Faraday lecture: "Courier to Carrier in Communications," T. B. D. Terroni. Colston Hall, Bristol, 6.45 p.m.

I.E.E. (Swansea sub-centre). "Service Experience of Effect of Corrosion on Steel-Cored-Aluminium Overhead Lines," J. S. Forrest and J. M. Ward. Elect. Showrooms, Kingsway, 6 p.m.

I.E.S. (Manchester). Contractors' Night. Elect. Offices, Town Hall, 6 p.m.

DERBY ELECTRICAL SOC. "Fine Measurements," J. R. Adams. Elect. Showrooms, Irongate, 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish). "Radio Telephone Systems to the Islands," T. Moxon. 39 Elmbank Cresc., Glasgow, 7 p.m.

FRIDAY, 11 FEB.

I.E.E. (N. Staffs). Annual dinner at Crown Hotel, Stone.

I.E.E. (London Students). Conversazione and dance at Savoy Place, W.C.2, 6.30 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Bratell Electric Co., Ltd. Home and domestic appliance manufacturers and dealers, etc. Nom. cap.: £1,000. Dirs.: to be appointed by subs. Subs.: B. M. Bloom and S. J. Bresloff, 76 New Cavendish St, W.

A. F. Richards Ltd. 53 Teign Bank, Hinckley. Electricians, dealers in wireless, electric, television, public address and recording apparatus, etc. Nom. cap.: £2,000. Dirs.: Gladys W. Richards and A. J. Richards.

Vacuum Services (Leicester) Ltd. 9/13 Applegate St, Leicester. Manufacturers of and dealers in vacuum cleaners, etc. Nom. cap.: £20,000. Dirs.: F. C. Smith and Mrs M. V. Smith.

Northbourne Electrical Co., Ltd. 902 Wimbourne Rd, Bournemouth. Nom. cap.: £15,000. Permanent directors: F. King, C. A. Davies, and D. R. Jacobs.

Kingston Control Systems Ltd. Empire Chambers, Richmond Rd, Kingston-on-Thames. To act as consultants and advisers on matters pertaining to fuel efficiency and fuel technology, to supply and install equipment and systems of heating, refrigeration and air conditioning plant, together with automatic controls, etc. Nom. cap.: £8,000. Dirs.: A. H. deRoemer, A. S. Hollamby, and C. F. Ide.

V. J. Howe (Electrical) Ltd. Boston Hse, 132 Cheapside, E.C.2. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £100. Dirs.: V. J. Howe and Florence M. Howe.

TRADE NOTES

Changes of Address. The new address of the London branch sales office of British Insulated Callender's Cables Ltd. is 10/14 White Lion Street, N.1. Telephone Terminus 8696 and 0372. The company's central administrative offices remain at 21 Bloomsbury Street, London, W.C.1.

The offices of Tyler and Freeman Ltd, are now at 25 Floral St, Covent Garden, W.C.2. Telephone Temple Bar 2768/9.

The senior electrical inspector of factories, Mr F. H. Mann, and his department, have moved to 19 St. James's Square, S.W.1. Telephone Trafalgar 7020.

Typical Hewittic rectifier for mass charging of batteries

Hewittic Rectifiers

REGD. TRADE MARK

for battery charging

Hewittic wall-mounting vehicle battery charger for charging a 30-cell lead acid battery at 30 amps. maximum

A Hewittic vehicle battery charger providing a maximum charging rate of 30 amps. for 80-cell lead acid batteries, as used for 2½ ton electric vehicles

MAINTAINED EFFICIENCY

The maintained efficiency of the Hewittic mercury arc glass bulb Battery Charging rectifier ensures that the correct charging rate to the battery will always be given irrespective of the number of years that the charger has been in service. (Hewittic chargers supplied 10 or 20 years ago are still working without loss of efficiency).

FULLY AUTOMATIC

Hewittic chargers can be designed to provide either a natural current taper or an automatic two rate charge depending upon the charging time available. They cut out automatically when the battery is fully charged, and can be set to give a slow equalising charge.

MAXIMUM BATTERY LIFE

Maximum life from the battery is ensured by the fact that Hewittic chargers are designed in accordance with the technical recommendations of battery makers many of which use Hewittic rectifiers in the formation of battery plates.

The high degree of electrical robustness of Hewittic chargers enables them to withstand reasonable sustained overloads, and their rectifying properties are unaffected by adverse atmospheric conditions. They are made in types and capacities for multiple or individual charging of all types of batteries. For small charging capacities Hewittic SenTerCel selenium rectifier equipments can be supplied.

Ask for Publications R228 and R235

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone : Walton-on-Thames 760 (8 lines) Telegrams : "Electric, Walton-on-Thames"

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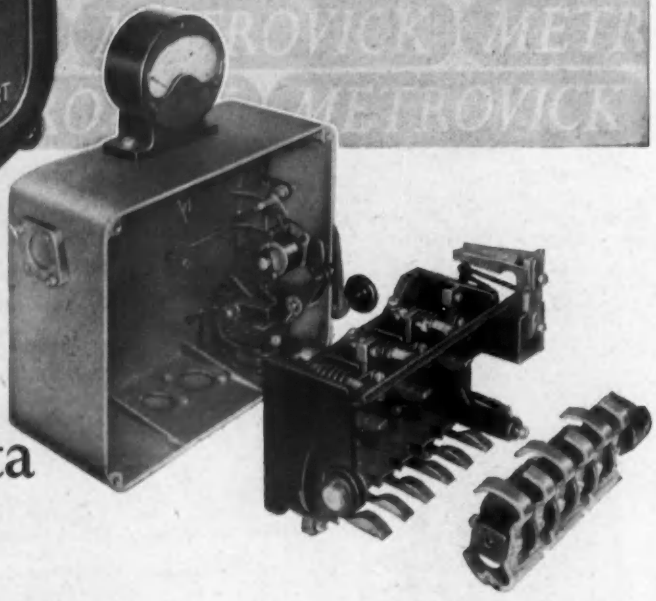

METROVICK air-break star-delta starters

The Metrovick reputation is based on sound engineering design and good workmanship. The standard is maintained in the type ASD series of starters which conform with BSS.587. They are suitable for squirrel cage motors up to 25 H.P. 650 volts. Write for full technical details.

Type ASD starters are intended for use in general industrial applications.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

Member of the AEI Group of Companies

H/A006

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

RAINHILL PARISH COUNCIL

STREET LIGHTING,
LIVERPOOL—WARRINGTON TRUNK ROAD
(A.57)

THE PARISH COUNCIL invite tenders for the proposed supply, erection and commissioning of sodium vapour discharge lighting units on the Liverpool-Warrington Trunk Road A.57, within the Parish District, for approximately 385 yds. The drawings and general conditions of contract may be inspected at the Liverpool City Lighting Department, 17 Highfield St, Liverpool, 3, and copies of the special conditions of contract, specification, and form of tender, may be obtained from the Clerk, Rainhill Parish Council, 124 St. Helens Rd, Prescot, Lancs, on payment of a deposit of two guineas, which will be refunded on the submission of a bona fide tender.

Tenders in a plain sealed envelope are to be addressed to the Clerk of the Council at 124 St. Helens Rd, Prescot, and received not later than 14 Feb., 1955.

The Council do not bind themselves to accept the lowest or any tender.

THOMAS R. JOWETT,
Clerk of the Council.

124 St. Helens Rd,
Prescot, Lancs.
25 Jan., 1955. (P 633)

STEPNEY M.B.C.

SIDNEY STREET HOUSING SCHEME—
PORTION "C"
BLOCKS 1, 2, 3 AND 4

TENDERS are invited for Electrical Installations for the above blocks of flats.

Forms of tender with conditions, etc., obtainable from Messrs Sydney Clough, Son and Partners, Devonshire Close, 39 Devonshire St, W.1, upon payment of deposit of £2 2s., made payable to the Council.

Closing date for tenders—Noon, 7 Mar., 1955.

WILFRED REEVE,
Town Clerk.
(P 632)

CITY OF BELFAST
Electricity Department

SUBSTATION DISTRIBUTION BOARD

TENDERS are invited for the supply and delivery of a medium voltage substation distribution board.

Form of Tender and specification (No. W.64) may be obtained at the Electricity Department, East Bridge St, Belfast.

Each Tender, in sealed envelope marked "Tender for Distribution Board, Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 25 Feb., 1955.

An official receipt must be obtained for each Tender delivered by hand. Tenders sent by post should be registered.

The lowest or any Tender will not necessarily be accepted.

JOHN DUNLOP,
City Hall, Belfast Town Clerk.
P.O. Box 234.
31 Jan., 1955. (P 672)

BOROUGH OF NEWARK-ON-TRENT

STREET LIGHTING

TENDERS invited for supply and erection of eighteen M.V. lamps on steel columns and 64 filament lamps on concrete columns.

Specifications and Forms of Tender from Borough Surveyor, on deposit of 2 guineas, to whom tenders returnable by 21 Feb., 1955.

J. H. M. GREAVES,
Municipal Buildings, Town Clerk.
Newark-on-Trent.
27 Jan., 1955. (P 656)

BOROUGH OF BASINGSTOKE

GROUP "A" STREET LIGHTING

TENDERS are invited for the Installation of a Group "A" Fluorescent Street Lighting Scheme for approximately 1,475 yds of Trunk Road, in Chapel St and Kingsclere Rd, Basingstoke.

Tenders may be submitted for either (*a*), (*b*) or (*c*) below or for the complete scheme:

(*a*) Supply of Electrical Equipment.
(*b*) Supply and Erection of Steel Columns, Brackets, etc., together with Fitting and Wiring Electrical Equipment offered in the firm's own tender.
(*c*) Supply and Erection of Steel Columns, Brackets, etc., together with Fitting and Wiring Electrical Equipment provided by another firm.

Bills of Quantities, Specifications, Conditions of Contract and Forms of Tender may be obtained from Mr W. G. A. Clark, B.SC., A.M.I.C.E., Borough Surveyor, Municipal Bldgs, Basingstoke, on payment of a deposit of £2. 2s. which will be returned on receipt of a bona fide Tender.

Drawings may be inspected at the Office of the Borough Surveyor during office hours.

Tenders in a plain, sealed envelope, endorsed "Street Lighting," must be delivered to the undersigned by 12 noon on 18 Feb., 1955.

The Corporation does not bind itself to accept the lowest or any Tender.

MEIRION O. JONES,
Municipal Bldgs, Town Clerk.
Basingstoke.
25 Jan., 1955. (P 634)

URBAN DISTRICT COUNCIL OF BRIGG

STREET LIGHTING

TENDERS are invited from Specialist Firms for the installation of 65 Units of Class "A" Street Lighting, comprising 48 Sodium and 10 Fluorescent on Concrete Columns and 7 Fluorescent Wall Brackets.

Specifications and Drawings may be obtained from Trevor Spurr, M.R.S.I., A.M.S.E., A.M.I.S.E., A.M.INST.H.E., A.M.TECH.I., Engineer and Surveyor, Riverside East, Brigg, Lincs, on payment of £2. 2s., which will be returned upon receipt of the "bona fide" tender.

Tenders should be forwarded to the undersigned in plain envelopes to be endorsed "St Lighting" and received not later than 9 a.m. on Thursday, 24 Feb., 1955. The Council do not bind themselves to accept the lowest or any tender, and acceptance of any tender will be subject to the approval of the Ministry of Transport.

JOSEPH J. MAGRATH,
Town Hall, Clerk of the Council.
Brigg, Lincs.
31 Jan., 1955. (P 696)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

DUNDEE REINFORCEMENT
POWER AND AUXILIARY CABLES BETWEEN CLUNIE SUBSTATION AND POWER STATION

TENDERS are invited for the supply and installation of 660 V Power and Auxiliary Cables between Clunie 132 kV Substation and Power Station, Perthshire. Copies of the Tender Document may be obtained on application with a cheque for £2. 2s. (returnable), to the Engineers, Messrs Kennedy and Donkin, 12 Caxton St, London, S.W.1.

The Board do not bind themselves to accept the lowest or any Tender.

H. W. SIMPSON,
16 Rothesay Terr, Secretary.
Edinburgh 3. (P 673)

CORRECTION

GOVERNMENT OF KUWAIT
Department of Electricity

33 kV TRANSMISSION SYSTEM

TENDER documents will be available in Kuwait on 2 Mar., 1955, not 22 Mar., 1955, as published in last week's issue.

(P 685)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

GOVERNMENT OF MALTA
Distribution System Changeover

ASSISTANT RESIDENT ENGINEERS

APPLICATIONS are invited for the temporary post of Assistant Resident Engineer for the Malta Electricity Supply Scheme. The Island Distribution Scheme is being remodelled to standard 50 cycle conditions and the works include 11 kV underground cables, overhead lines, indoor and outdoor substations, low voltage distributors, and the adaptation of existing single-phase lines where practicable.

Candidates should be Corporate Members of the Institution of Electrical Engineers, or have equivalent qualifications, and a sound experience of modern underground and overhead distribution practice.

The appointment is temporary for a period of two years with the option of extension. The consolidated salary will be at the rate of £1,500 per annum. Free passages will be provided for the person employed, his wife and family (if any) at the start and finish of the Agreement. Leave will be granted at the rate of 2½ days for each completed month of residential service at the conclusion of the Agreement.

Applications endorsed "Assistant Resident Engineer, Malta," stating age, qualifications and experience should be sent to the undersigned, who will communicate with candidates selected for interview.

PREECE, CARDEW AND RIDER,
8-12 Queen Anne's Gate,
London, S.W.1.
(P 688)

BRITISH ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for the following position:

ASSISTANT SHIFT CHARGE ENGINEER,
SWINDON GENERATING STATION
S/13.616

Applicants should have had previous experience in a modern generating station. Manufacturing works experience will be an advantage. Preference will be given to those who possess either qualifications and experience leading to Corporate Membership of a recognised Professional Institution, or who are studying for the examinations of such an institution.

Salary N.J.B. Class E, Grade 9, £635 x £15—£680.

Special application forms obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 16 Feb. Please quote reference EP. (P 677)

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.MECH.E. for posts (*a*) an advantage.

(*a*) ASSISTANT ENGINEER (STATISTICS)
BANKSIDE GENERATING STATION
Vacancy No. 55/77

Successful candidate will be responsible for compilation of technical statistics. Salary Class H, Grade 14=£582. 15s. per annum.

(*a*) ASSISTANT ENGINEER (MECHANICAL)
GROVE ROAD GENERATING STATION
Vacancy No. 55/78

Successful candidate will be required to take charge of drawing office work, lifting tackle tests and records and to assist generally. Salary—Class F, Grade 11=£624. 15s. per annum.

(*a*) ASSISTANT SHIFT CHARGE ENGINEER
WOOLWICH GENERATING STATION
Vacancy No. 55/79

Sound engineering and technical training necessary with practical experience in the operation of a modern Generating Station including High Pressure Plant. Salary—Class G, Grade 9=£750. 15s. per annum.

Construction Department, Divisional Headquarters

(*a*) THIRD ASSISTANT ENGINEERS (MECHANICAL) (2)
Vacancy No. 55/80

Vacancies exist in the Mechanical Engineering Section and for duties at Construction Sites. Candidates should have experience in the handling of plant contracts and/or supervision of erection work at sites. Salary—Class AX/EX, Grade 4=£787. 10s./£1,023. 15s. per annum.

SECOND ASSISTANT ENGINEER (MECHANICAL)
Vacancy No. 55/81

Successful applicant will be required to handle contracts, prepare schemes, estimates and specifications, and analyse tenders for mechanical plant in generating stations and supervise engineers on subordinate grades carrying out similar work. Previous experience in this class of work together with some site erection experience is essential. Applicants to be corporate members of the Institution of Mechanical Engineers or have equivalent qualifications.

SECOND ASSISTANT ENGINEERS (CONSTRUCTION) (2)
Vacancy No. 55/82

Successful applicants will be required to carry out general administrative duties in connection with Generation Construction projects, both in the planning stages and in supervision of erection at sites. Duties demand character, personality, general ability and resourcefulness rather than a high degree of specialised engineering knowledge. Applicants should, however, be thoroughly conversant with generating station plant and preferably have some experience of construction procedure. They should also be capable of preparing minutes of meetings, reports, etc. Applicants should be corporate members of at least one of the three major Institutions, or have equivalent qualifications. Salary—Class AX/EX, Grade 2=£997. 10s./£1,245 per annum for Vacancies 55/81 and 55/82.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box 136, Generation Hse, Great Portland St, W.1, and be received within 14 days of this advertisement. (P 659)

SOUTH WALES ELECTRICITY BOARD

require ENGINEERING DRAUGHTSMAN in the Head Office of the Board, St. Mellons.

Salary—Schedule D, Grade 6 (£510/£630) of N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to reach him not later than 12 Feb., 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (P 667)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments, which are superannuable and subject to medical examination, in the Board's No. 1 Sub-Area Headquarters, 24 Hatton Garden, Liverpool, 3:

GENERAL ASSISTANT ENGINEER in the Planning Section. Salary £715/£760 per annum (N.J.B. L/13). Applicants should preferably have the technical qualifications necessary to enable them to become Chartered Electrical Engineers, and have experience in the distribution of electricity, and possess knowledge of the technical and economic principles underlying the design of distribution systems.

Special application forms obtainable from the Manager at the above address. Closing date: 14 Feb., 1955.

ENGINEERING DRAUGHTSMAN. Salary within the range £510/£630 per annum (N.J.B. Schedule D, Grade 6) according to experience. Applicants should be experienced in either:

(*a*) layout of electrical switchgear and substations, or
(*b*) building work as applied to industrial or commercial premises.

Possession of not less than Ordinary National Certificate would be an advantage.

Applications should be forwarded to the Manager at the above address. Closing date: 14 Feb., 1955. (P 639)

BRACKNELL DEVELOPMENT CORPORATION

APPLICATIONS are invited for the appointment of TECHNICAL ASSISTANT (Services) on the staff of the Chief Engineer at a salary in the grade £530 x £20—£680 per annum.

The duties will comprise co-ordination of work undertaken by statutory bodies (gas, water and electricity) in relation to the Corporation's building programme, the administrative work connected therewith, and the maintenance of a records system. Preference will be given to persons with previous experience in electrical engineering.

Superannuation schemes; medical examination, housing available in due course. Apply by Monday, 14 Feb., 1955, giving age, education, qualifications, experience and appointments held (with dates and salaries) together with the names of two referees to the General Manager, Bracknell Development Corporation, Farley Hall, Bracknell, Berks, marking the envelope "T.A.S." (P 686)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments in the Generation (Construction) Department at Divisional Headquarters.

Vacancy No. 13/55

(1) GENERAL ASSISTANT ENGINEERS, Salary AX/DX 6 £600/£785 per annum.

Applicants should preferably have a knowledge of mechanical or electrical plant for Power Stations. H.N.C. or equivalent desirable. Closing date 14 Feb., 1955.

DRAWING OFFICE—GENERATION (CONSTRUCTION) DEPARTMENT
Vacancy No. 14/55

(2) (*a*) SENIOR DRAUGHTSMAN (ELECTRICAL). Salary Schedule "D," Grade 5, £640/£740 per annum. (*b*) ENGINEERING DRAUGHTSMAN (ELECTRICAL). (*c*) ENGINEERING DRAUGHTSMAN (CIVIL). Salary Schedule "D," Grade 6, £510/£630 per annum.

Candidates should be suitably qualified and have had experience for (*a*) and (*b*) in the preparation of layouts and diagrams for the installation of power station auxiliaries, E.H.T. and L.T. switchgear, transformers and cables. Knowledge of protective gear systems advantageous.

For (*c*) designing or detailing reinforced concrete structures, structural steelwork or general building construction such as are associated with heavy industrial work. Closing date 18 Feb., 1955.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff. (P 676)

SOUTH WALES ELECTRICITY BOARD

require COMMERCIAL ASSISTANT, District 443 (Tredegar), Eastern Sub-Area.

Applicants must have had experience in the application of electricity to domestic and commercial premises and all general purposes.

Salary—Class E, Grade 9 (£635/£680) of N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 12 Feb., 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (P 666)

GOLD COAST GOVERNMENT

ELECTRICAL ENGINEERS. Applications invited for posts of SUPERINTENDENT ENGINEER and two SENIOR STATION ENGINEERS. The duties of the Superintendent Engineer would include under the general direction of the Chief Electrical Engineer and his Deputy (*a*) the assumption of full responsibility for the detailed investigation, planning and design, and execution, of new and additional electricity supplies, (*b*) the supervision of other development engineering staff.

Qualifications: Applicants should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications. They must have had wide experience, over at least 10 years, in the design, construction and operation of E.H.T. and L.T. underground and overhead distribution systems. They should have a full knowledge of contract procedure and be able to control contracts. A knowledge of compression ignition engines is also desirable. Experience in the problems of electricity supply in tropical climates would be an advantage.

Senior Station Engineers. Post A for generation work, Post B for distribution work.

Duties: These will include, under the general direction of the Chief Electrical Engineer and his Deputy (*a*) the assumption of full responsibility for the detailed investigation, planning and design and execution of new and additional electricity supplies, (*b*) the supervision of other development engineering staff.

Qualifications: Applicants should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications. They must have had wide experience, over at least 10 years, in the design, construction and operation of E.H.T. and L.T. underground and overhead distribution systems. They should have a full knowledge of contract procedure and be able to control contracts. A knowledge of compression ignition engines is also desirable. Experience in the problems of electricity supply in tropical climates would be an advantage.

Terms of Service: The appointments will be on contract gratuity terms for 3 tours of 18-24 months. Salary for Superintendent Engineer in range £2,100/£2,500 per annum, for Station Engineers in range £1,330/£1,680 per annum according to age, qualifications and experience. Gratuity at the rate of £37. 10s. for each completed 3 months of satisfactory service will be payable on final termination of the contract.

Free passages on first appointment and on leave will be provided for the officer and his wife once each way during each tour of service. Officers will normally be required to travel by air. Free air passages will also be provided for up to a maximum of 3 children under 13 years of age.

Vacation leave with pay: 7 days for each month of service. Free medical and dental attention provided for officer and family. Furnished quarters available at low rental. Income tax at local rates. Kit allowance of £60/£30 according to salary may be payable.

It is possible for the superannuation rights of candidates in Local Government Service to be frozen.

Candidates should apply to the Adviser on Recruitment, Gold Coast Office, Melbourne Hse, Aldwych, London, W.C.2, for a form of application. (P 635)

THE NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF
ENGINEERING DRAUGHTSMAN
(ELECTRICAL)
SUB-AREA TECHNICAL ENGINEER'S
DEPARTMENT, MANCHESTER

APPLICANTS should have had a good technical training and drawing office experience in the electrical design, layout and detailing of indoor and outdoor substations, up to and including 33,000 V, together with the preparation of protective system schematic and wiring diagrams.

Salary within the range £510 x £20—£630 per annum according to qualifications and experience. Schedule "D," Grade 6, N.J.B. Conditions.

APPOINTMENT OF
SECOND ASSISTANT DISTRICT ENGINEER
NORTH WEST DISTRICT, ECCLES

The duties will include the supervision of the erection and maintenance of substation switchgear, laying and jointing of cables, and switching operations on the H.V. and L.V. systems within the District, as required. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £790 x £20—£850 per annum. Grade G.7, N.J.B. Conditions.

Applications for the above posts to the Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 12 Feb., 1955.

APPOINTMENT OF
SECOND ASSISTANT ENGINEER
(POWER SALES)
SUB-AREA CONSUMERS' ENGINEER'S
DEPARTMENT, BLACKBURN

Applicants must have had experience in the development of industrial sales, with particular reference to the Textile and Engineering Industries, Public Lighting and D.C. to A.C. Changeover investigations, and have obtained the H.N.C. in Electrical Engineering.

Salary Scale: £975 x £25—£1,050 per annum, Grade K.7, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee St, Blackburn, by 12 Feb., 1955.

APPOINTMENT OF
THIRD ASSISTANT ENGINEER
(CONSTRUCTION)
SUB-AREA ENGINEER'S DEPARTMENT,
CASTLE GREEN, KENDAL

Applicants should have had a sound technical training and be capable of preparing schemes and estimates for H.V. and L.V. networks and substations up to 33 kV with practical experience of this work.

Qualifications leading to Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £755 x £15—£800, Grade J.10, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by 12 Feb., 1955. (P 624)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Lanarkshire Sub-Area

APPOINTMENT OF
GENERAL ASSISTANT ENGINEER
(SUB-AREA PLANNING AND DEVELOPMENT
DEPARTMENT)

APPLICATIONS are invited for the above appointment. Candidates should have had a sound engineering training followed by some experience on the Distribution side of the Electricity Supply Industry.

The Salary and Conditions of Service for this appointment will be in accordance with the National Joint Board's Agreement, Schedule "A" (Revised), the present Classification and Grading is K.13, Salary (Revised) £675/£720 per annum, which will be subject to the statutory deductions including superannuation. The successful candidate will require to reside within a reasonable distance of the Sub-Area Offices at Hamilton.

Application forms, which may be obtained from the undersigned, should be returned to this office within 14 days of the date of this advertisement.

DUGALD SMITH,
Manager.

137 Almada St,
Hamilton. (P 640)

CITY OF BIRMINGHAM PUBLIC WORKS DEPARTMENT

APPLICATIONS are invited for the following positions in the Mechanical and Public Lighting Section.

(*a*) ELECTRICAL ENGINEERING ASSISTANT, Grade A.P.T. V (£750/£900 per annum).

(*b*) ELECTRICAL ENGINEERING ASSISTANT, Grade A.P.T. IV (£675/£825 per annum).

Commencing salary in accordance with qualifications and experience.

Applicants for the above posts should be Associate Members of the Institution of Electrical Engineers, or hold equivalent qualifications. They should have had considerable experience in the design, specification and supervision of contracts of electric lighting, power and heating installations in large public buildings.

The posts are permanent, superannuable, subject to a medical examination and to one month's notice on either side.

Applications endorsed with the description of the post applied for, stating qualifications, age and experience, together with the names of two persons to whom reference can be made should reach the undersigned not later than 26 Feb., 1955.

Canvassing disqualifies.

HERBERT J. MANZONI,
City Engineer and Surveyor.

Civic Centre,
Birmingham, 1.
21 Jan., 1955. (P 623)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the position of DEPUTY CHIEF ENGINEER (Generation).

Applicants should have had considerable experience of modern generating station practice and have either a Degree in Electrical or Mechanical Engineering or be qualified as full members of either the Institution of Electrical Engineers or the Institution of Mechanical Engineers.

The salary will be £3,000 per annum and the appointment is superannuable.

Forms of application, with additional particulars of the post, may be obtained from the undersigned and must be submitted by Monday, 14 Feb., 1955.

J. MEEK,
Secretary.

P.O. Box 173,
351 Sauchiehall St,
Glasgow C.2.
21 Jan., 1955. (P 590)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following posts:

(1) SHIFT CHARGE ENGINEER—GOLDINGTON GENERATING STATION, BEDFORD.

(2) STATION CHEMIST—GOLDINGTON GENERATING STATION, BEDFORD.

Salary Class G, Grade 7, £790 x £20—£850 per annum, eventually rising to Class H.

The Station, at present under construction, will comprise six unitised turbo-alternators and P.F. Boilers, each of 30 MW capacity.

Applicants for (1) should preferably have served an apprenticeship and have obtained a recognised qualification in Electrical or Mechanical Engineering and past experience in the operation of a generating station fired with pulverised fuel.

Applicants for (2) must have a minimum qualification of Higher National Certificate (Chemistry) and preference will be given to those with qualification of B.Sc. or A.R.I.C. Experience in the chemical control and testing of modern power station plant and materials is essential and applicants should also be conversant with the problems of corrosion, boiler fouling, etc.

Applications stating age, qualifications and experience should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than 12 Feb., 1955.

W. N. C. CLINCH,
Controller.
(P 663)

THE FOOT-AND-MOUTH DISEASE RESEARCH INSTITUTE

APPLICATIONS are invited for the post of MAINTENANCE ELECTRICIAN at the above Institute. Applicants should be capable of maintaining equipment and electrical installation in the various buildings. Experience with laboratory equipment would be an advantage. Wages will be in accordance with the appropriate trade rate for the district. Applications should be sent to the undersigned immediately.

N. SMITH,
Secretary.

Pirbright,
Surrey. (P 671)

BRITISH ELECTRICITY AUTHORITY

North West Merseyside and North Wales Division

VACANCY No. E. 72/28/T—MAINTENANCE ENGINEER (Mech.) at the new Fleetwood Generating Station. Salary £790 x £20—£850 (F.6).

Vacancy No. E. 72/29/T.—MAINTENANCE ENGINEER (Elec.) at the new Fleetwood Generating Station. Salary £790 x £20—£850 (F.6).

Vacancy No. E. 72/30/T. ASSISTANT SHIFT CHARGE ENGINEERS (5) at the new Fleetwood Generating Station. Salary £675 x £15—£720 (F.9).

Vacancy No. E. 72/33/T.—MAINTENANCE ENGINEER (Elec.) at Chadderton "B" Generating Station, near Manchester. Salary £840 x £20—£900 (G.6). Previous applicants under Vacancy 220/54 need not re-apply.

Vacancy No. E. 72/38/T.—SENIOR DRAUGHTSMAN (Mech.), Generation Construction Department, Liverpool. Salary £640 x £20—£740 (5/D).

Vacancy No. E. 72/39/T.—ASSISTANT SHIFT CHARGE ENGINEER, Roosecote Generating Station, near Barrow. Salary £715 x £15—£760 (G.9).

Applications quoting vacancy No. to Divisional Secretary, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 12 Feb. (P 648)

THE NORTH EASTERN ELECTRICITY BOARD

Wear Sub-Area

APPLICATIONS are invited for the appointment of SECOND ASSISTANT DISTRICT ENGINEER, Sunderland District.

Salary Schedule A, Class F, Grade 7, £755/£800. N.J.B. conditions of service.

Applications stating age, qualifications and experience should be forwarded to the Secretary (Establishments), The North Eastern Electricity Board, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (P 668)

SOUTH EASTERN ELECTRICITY BOARD

SENIOR SHOWROOM ASSISTANT
Lewes District

SALARY £525 x £20—£585 under N.J.C. Grade 2. Superannuable. Applicants should have a wide experience of showroom work and be conversant with tariffs, stock and sales procedure.

Applications, naming 2 referees, to G. R. Lincoln, A.I.E.E., District Manager, SEEBoard, 80/81 High St, Lewes, Sussex, by 16 Feb., 1955.

SHOWROOM ASSISTANT (MALE)
Croydon District

Salary within the ranges £170/£410 per annum or £190/£495 per annum plus London Weighting, according to age and experience. Superannuable. New entrants for the higher scale must have obtained the General Certificate of Education at Ordinary Level in at least four subjects including English and mathematics. A knowledge of electrical apparatus and experience in dealing with consumers' enquiries will be an advantage. The person appointed must be prepared to work in any of the Croydon district showrooms.

Applications, naming 2 referees, on forms from H. Lowe, M.I.E.E., District Manager, SEEBoard, Electric House, Wellesley Rd, Croydon, Surrey by 16 Feb., 1955.

A. L. BURNELL,
Secretary.
(P 660)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

SENIOR DRAUGHTSMAN, TRANSMISSION DEPARTMENT DIVISIONAL HEADQUARTERS
Vacancy No. 18/55/ET

Previous experience on the Design and Construction of H.V. Substations, overhead Transmission Lines or Cable Systems preferred, but is not essential.

Salary will be in accordance with Schedule D, Grade 5 (£640 x £20—£740 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 14 Feb., 1955.

ASSISTANT SHIFT CHARGE ENGINEER AVON POWER STATION, WARWICK
Vacancy No. 19/55/ET

Applicants should hold the Higher National Certificate or equivalent qualification and have had experience in Power Station Operation.

Salary will be in accordance with Class E, Grade 9 (£635 x £15—£680 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 14 Feb., 1955.

JUNIOR ENGINEERS, FREEMEN'S MEADOW POWER STATION, LEICESTER
Vacancy No. 27/55/ET

Some experience in Control Room and Boiler House work in a large P.F. Station is required. Technical qualifications up to H.N.C.

Salary in accordance with Class H, Grade 16 (£475 x £15—£520 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 21 Feb., 1955.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25 Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. E. JEFFREY,
Divisional Controller.
(P 662)

SOUTHERN ELECTRICITY BOARD

DRAUGHTSMAN (CIVIL ENGINEERING)

NO. 1 (Southall) Sub-Area, Waterloo Rd, Uxbridge, Middlesex. Salary N.J.B. Schedule D, Grade 6 (£535. 10s./£661. 10s. per annum, inclusive of London Allowance), N.J.B. Conditions of Service.

Applicants should have had training and experience in building construction and the design of steelwork and reinforced concrete structures, and be capable of preparing drawings, and making calculations.

The successful candidate for this appointment will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 2/6 Windmill Lane, Southall, Middlesex, and returned to him not later than 18 Feb., 1955. (P 670)

UGANDA ELECTRICITY BOARD

APPLICATIONS are invited for a permanent post as DRAUGHTSMAN overseas.

Applicants should have had sound technical training; drawing office experience with an electricity supply undertaking is desirable. Experience in high voltage system design, including substation and switchgear layout, preferably up to 132 kV, is essential. Some experience in general field work would be an advantage.

Free partly furnished accommodation, medical and dental treatment and passages in accordance with regulations. Leave on full pay after initial three-year contract.

Salary in the scale £990 x £30—£1,260.

Application forms and further particulars from Uganda Electricity Board, 27 Regent St, London, S.W.1. Forms to be returned to London Office by 14 Feb.

C. R. WESTLAKE,
Chairman.
(P 636)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

STATION SHIFT CONTROL ENGINEER is required at Nechells "B" Power Station, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade J10, commencing at £755 per annum.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualification an advantage.

Apply quoting Vacancy No. 877MD on form A.E.6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 19 Feb., 1955. (P 690)

LONDON COUNTY COUNCIL

TECHNICAL ASSISTANTS required with experience in preparing specifications for electrical installations in buildings.

Salaries for applicants holding H.N.C. (Elect.) or equivalent up to £739 per annum, for those holding O.N.C. (Elec.) or equivalent up to 213s. per week. Application form (returnable within 14 days) from Chief Engineer (55/6) London County Council, County Hall, S.E.1. (Enclose S.A.E.) (76).
(P 626)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

Edmonton District, Northmet Sub-Area
GENERAL ASSISTANT ENGINEER (REF. 513) 19/55.R

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.

Salary will be in accordance with Class F, Grade 11, of the National Joint Board Salary Agreement, commencing at £595, plus London Allowance.

Apply to the District Manager, Eastern Electricity Board, 305 Fore St, Edmonton, London, N.9.

Suffolk Sub-Area
THIRD ASSISTANT ENGINEERS (SYSTEM CONTROL)
18/55.N

A number of Third Assistant Engineers are required to act as System Control Engineers on shift duties at Suffolk Sub-Area Control, Woodland, Stowmarket.

Candidates should preferably have had experience in the operation and maintenance of urban and rural networks at voltages up to 33 kV. A successful candidate who has not previously carried out Control duties on an extensive system will be given the necessary training for a specified period.

Salary will be in accordance with Class J, Grade 10 of the National Joint Board Salary Agreement, commencing at £755.

Apply to the Manager, Suffolk Sub-Area, Eastern Electricity Board, Finborough Hall, Stowmarket, Suffolk.

Future salaries and conditions of service for all these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager concerned within 14 days of the appearance of this advertisement. (P 665)

BRITISH ELECTRICITY AUTHORITY
South Western Division

ASSISTANT SHIFT CHARGE ENGINEER required at Plymouth "A" Generating Station.

Superannuation Scheme. Salary, N.J.B. Class F, Grade 9, £675/£720.

Applicants should have had a sound technical training and practical experience in a modern generating station.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 21 Feb., 1955
(P 649)

YORKSHIRE ELECTRICITY BOARD
No. 1 (Bradford) Sub-Area

Keighley District
DISTRICT COMMERCIAL ENGINEER

APPLICANTS should have considerable experience in the commercial and engineering aspects of a district organisation, including negotiations with all classes of consumers. They must be capable of preparing estimates, tenders and specifications, and supervising complete domestic, commercial and industrial installations of all types. The possession of a Higher National Certificate in electrical engineering or its equivalent will be an advantage.

Salary—N.J.B. Class E, Grade 4, £840/£20/£900 per annum. It is possible that the Keighley District may be reclassified with effect from 1 Apr., 1955, in which case the salary for the post would be £900/£25/£975 per annum, in accordance with Class F, Grade 4.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford, not later than 17 Feb., 1955.

No. 4 (Leeds) Sub-Area

GENERAL ASSISTANT ENGINEER (METERS, TESTING AND PROTECTION)

Applicants should be Graduate Members of the I.E.E. or have exempting qualifications and have had a sound practical training in the electrical industry.

Experience of the commissioning of distribution substations, routine maintenance of protective equipment and testing of new distribution equipment will be an advantage.

The successful applicant may be required to undertake standby duties for cable fault location.

Salary—N.J.B. Class K, Grade 13, £675/£15/£720 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 17 Feb., 1955.

No. 5 (Wakefield) Sub-Area

Castleford District
ASSISTANT CONSUMERS' ENGINEER

Applicants, who must have had a sound practical training and a fair amount of experience in the work of a Consumers' Engineer, will be required to give advice to all classes of consumer concerning the utilisation of electricity. Experience in the interpretation of the I.E.E. Wiring Regulations and in tariffs will be an advantage.

Preference will be given to applicants holding a Higher National Certificate in Electrical Engineering, or some other approved qualification.

Salary—N.J.B. Class F, Grade 10, £635/£15/£680 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 17 Feb., 1955.

No. 7 (Grimsby) Sub-Area

Scunthorpe District
GENERAL ASSISTANT DISTRICT ENGINEER

Applicants should preferably be Graduates of the Institution of Electrical Engineers or hold either the Higher National Certificate in Electrical Engineering or an equivalent qualification. They should have experience in the construction, operation and maintenance of H.V. and L.V. Overhead and Underground Distribution Systems.

Salary—N.J.B. Class F, Grade 11, £595/£15/£640 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 17 Feb., 1955. (P 669)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Worcester and District Sub-Area

FIRST ASSISTANT DISTRICT ENGINEER, STRATFORD-ON-AVON DISTRICT

Experience necessary in all branches of distribution work including construction, operation and maintenance of high and low voltage underground and overhead distribution systems. Experience on changeover work would also be an advantage. Technical qualifications desirable. Salary £755/£800 per annum (N.J.B. Class D, Grade 5).

DEMONSTRATOR (FEMALE) BROMSGROVE DISTRICT

Applicants must have had good education and should have a certificate of a recognised Domestic Training College and/or the E.A.W. Certificate. Duties include lecture demonstration in Service Centres and on consumers' premises and advising consumers on the selection and use of electrical appliances. Salary £425/£525 per annum (N.J.C. Grade 1).

Apply in writing within fourteen days stating age, experience, present salary and position to Mr R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

Central Gloucestershire Sub-Area

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER, STROUD DISTRICT

Duties will include the preparation of wiring schemes and estimates for all types of premises and sale of electrical equipment associated therewith, also advice to consumers on utilisation of supply. Applicants should have had sound technical training and experience in the above duties. Salary £595/£640 per annum (N.J.B. Class E, Grade 10).

Applications stating age, qualifications, experience, present salary and position to Mr D. Holt, Sub-Area Manager, Midlands Electricity Board, 126 London Rd, Gloucester. A. Stephens, Secretary. (P 664)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

APPLICATIONS are invited for the following positions:

GENERAL ASSISTANT ENGINEER (COMMUNICATIONS) MAIDSTONE

Applicants should preferably possess Higher National Certificate in Electrical Engineering or equivalent qualifications and have experience in the maintenance of automatic and line transmission telephone apparatus. Some knowledge of power supervisory systems and VHF radio would be an advantage. Successful applicant will be based at Maidstone and his duties will be concerned with the Authority's tele-communications systems at this and other Stations in the District. Salary commencing at £600 per annum rising annually to £725 then to £785 per annum.

THIRD ASSISTANT ENGINEER (COMMUNICATIONS) DIVISIONAL HEADQUARTERS—KINGSTON

Applicants should preferably possess Higher National Certificate in Electrical Engineering or equivalent qualifications and have wide experience of the commissioning and maintenance of automatic and line transmission telephone apparatus, power supervisory systems, tele-metering and VHF radio. Some knowledge of industrial electronics would be an advantage. Successful applicant will be required to assist the Communications Engineer in the management of the Authority's tele-communications systems in this Division. Salary commencing at £750 per annum and rising annually to £875 and then to £950 per annum plus London Allowance.

SECOND ASSISTANT ENGINEER (PROTECTION) DIVISIONAL HEADQUARTERS—KINGSTON

Applicants must have a degree or Higher National Certificate in Electrical Engineering and a thorough and up-to-date knowledge of the principles, application and management of automatic protective gear, together with experience in commissioning electrical plant in Power Stations and Transmission Substations. Successful applicant will be required to supervise the work of Engineering staff in the field, to direct the investigation of faults in electrical plant and analyse protective gear performance and to carry

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out and report upon such special investigations as may be required within his sphere of interest. Salary commencing at £950 per annum rising annually to £1,075 then to £1,165 per annum plus London Allowance.

THIRD ASSISTANT ENGINEER (METERING)—CROYDON

Applicants should preferably possess Higher National Certificate in Electrical Engineering or equivalent qualifications and wide experience in the testing and maintenance of impulse summation metering and electrical measuring instruments and be familiar with calibration and standardising methods, including testing of current and voltage transformers as applied in a well equipped polyphase Meter Testing Laboratory. Successful applicant will be based at Croydon "B" Power Station and will be required to assist the Meter Engineer in the management of the Authority's metering in this Division. Salary commencing at £750 per annum rising annually to £875 then to £950 per annum plus London Allowance.

THIRD ASSISTANT ENGINEER —OPERATION DEPARTMENT

Applicants should be educated to Higher National Certificate standard and be capable of applying common sense and initiative to the planning, co-ordination and progressing of plant maintenance. Salary commencing £750 per annum rising annually to £875 then £950 per annum plus London Allowance.

Applications, giving details of education, present position, experience, etc., should be sent to the Establishments Officer, British Electricity House, Lower Ham Rd, Kingston-upon-Thames, to arrive by 14 Feb. (P 658)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

JOINTER E.H.T. wanted for Berwick District, Southern Sub-Area, to reside in Berwick-upon-Tweed. N.J.I.C. conditions. Present rate of pay 49d. per hour. Applications stating age, whether married or single and giving details of training and experience should reach the Board, High St, Galashiels, by 22 Feb., 1955. (P 689)

SOUTH WESTERN ELECTRICITY BOARD

1. SECOND ASSISTANT DISTRICT ENGINEER (CONSTRUCTION) BRIDGWATER

SALARY N.J.B. Class E, Grade 7—£715/£760 per annum.

Candidates should be experienced in the operation and construction of H.V. and L.V. substation equipment and H.V. and L.V. overhead and underground mains.

2. THIRD ASSISTANT ENGINEERS (TWO)—SUB-AREA HEADQUARTERS, TAUNTON

Salary N.J.B. Class G, Grade 10—£675/£720 per annum.

Duties embrace planning in the field of H.V. and L.V. lines, including surveying, profiling and scheduling of materials and preparation of capital applications.

These appointments form part of a mobile gang working throughout the Sub-Area.

3. THIRD ASSISTANT DISTRICT ENGINEER—BARNSTAPLE

Salary N.J.B. Class D, Grade 8—£635/£680 per annum.

Duties relate to operation, maintenance and construction work in the District.

4. THIRD ASSISTANT DISTRICT ENGINEER (CONSTRUCTION)—WESTON

Salary N.J.B. Class E, Grade 9—£635/£680 per annum.

Duties relate to construction of overhead lines and underground cables, preparation of material schedules, phasing of work, reports and statistics.

5. GENERAL ASSISTANT ENGINEER—WESTON

Salary N.J.B. Class E, Grade 11—£555/£600 per annum.

Duties concern operation, maintenance and construction work in the District.

Technical qualifications at least equivalent to the H.N.C. are necessary for all posts. The successful candidates for Posts 1, 3, 4 and 5 will be required to undertake standby duties.

Application forms obtainable from the Manager, Taunton Sub-Area, The Parade, Taunton (for Post 1, 2 and 3) and from the Manager, Weston District, 19/20 Waterloo St, Weston-super-Mare (for Post 4 and 5) should be returned by 15 Feb., 1955. (P 661)

BRITISH ELECTRICITY AUTHORITY

North Eastern Division

APPLICATIONS are invited for the appointment of SHIFT CHARGE ENGINEER at Darlington Power Station.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule "A," Grade 7, Class F (£755/£860 per annum).

Forms of application may be obtained from Divisional Establishments Officer, British Electricity Authority, North Eastern Division, Carliol Hse, Newcastle-upon-Tyne, 1, to whom they should be returned to arrive not later than 15 Feb., 1955. (P 638)

ALBRIGHT AND WILSON LTD., Chemical Manufacturers, have vacancies for Electrical Engineers in the Central Engineering Department at Oldbury, Birmingham, as follows:

1. AN ELECTRICAL ENGINEER is required for design and planning work for new electrical installations throughout the Company's factories. The work involves some supervision of construction necessitating periods of residence at the Company's various factories. Necessary qualifications are a degree or equivalent in electrical engineering and 3—6 years' experience of electrical distribution and maintenance in industry.

2. ELECTRICAL DRAUGHTSMEN are required for circuit diagrams and layout of lighting and power installations. H.N.C. in electrical engineering with experience in electrical layouts, lighting circuit diagrams and distribution systems are the qualifications sought. Age 25—30.

These appointments carry membership of the Company's non-contributory pension scheme. Apply stating age, qualifications and experience to the Staff Officer, Albright and Wilson Ltd., P.O. Box 3, Oldbury, Birmingham. (P 553)

APPLICATIONS are invited for the appointment of a RESIDENT ENGINEER "Electrical" at Kano Airport, Nigeria, to supervise the electrical installation in the new Terminal Building. The appointment will be for one tour of 18 months at a salary of £1,600 per annum plus gratuity of £12. 10s. per month payable at the completion of the tour. Outfit allowance of £60. Free passage and car allowance. Free single quarters provided but a charge of 10s. per day will be made for feeding. Candidates should have the Higher National Certificate or equivalent qualification and should have had wide experience of large electrical installations and some knowledge of Air Conditioning Plant. Applications should be forwarded to Messrs Barlow, Leslie and Partners, Consulting Engineers, 5 Catherine Place, Westminster, London, S.W.1, giving full particulars of experience, qualifications and age. (P 618)

JOHNSON AND PHILLIPS LTD.

APPOINTMENT OF CHIEF RUBBER CABLE TECHNOLOGIST

Applications are invited for the position of Chief Rubber Cable Technologist at our London factory.

Applicants must possess extensive experience in the design and manufacture of rubber and thermoplastic cables with intimate knowledge of materials and compounds.

The duties involve responsibility for all routine technical work relating to rubber cables and materials and for research and developments.

The appointment will carry a good salary with the benefits of generous pension and benevolent schemes.

Applications, which will be treated in strict confidence, should give full particulars of education, training, experience and age, and should be addressed to the Managing Director, Victoria Works, Charlton, London, S.E.7. (P 582p)

FERRANTI LTD.

Transformer Research, Development and Design

Applications are invited for the following vacancies:

(1) SENIOR ENGINEERS with good honours degrees in Electrical Engineering and with previous experience of research and development or design work in power engineering. The work covers transformers, voltage regulators and specialised high-voltage equipment. Ref.: T.S.E.

(2) JUNIOR ENGINEERS of approx. H.N.C. standard for work in the same fields. Ref.: T.J.E. A few vacancies exist also for DRAUGHTSMEN. Ref.: T.D.O.

These appointments are to the permanent staff and are pensionable.

Application forms from Mr T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote appropriate reference. (P 568p)

A WELL known Manchester engineering company has a limited number of vacancies for TRAINEE DRAUGHTSMEN. The following qualifications and experience are essential: A full apprenticeship in mechanical or electrical engineering and successful completion of S.2 Ordinary National Certificate. Age 21-26. Applicants must have completed National Service. Write giving full particulars of age, qualifications, experience, and marking envelope "Trainee Draughtsman," to—Box No. 4223, Electrical Times. (P 629)

BRITISH ELECTRICITY AUTHORITY invite applications for two superannuable posts as PRINCIPAL ASSISTANT in the Estates Branch of the Secretary's Department at Headquarters in London. Salaries N.J.C. Grade 9 (£1,120/£1,240) and N.J.C. Grade 8 (£1,000/£1,120), inclusive. The duties of the Grade 9 post comprise administrative work connected with the acquisition of wayleaves for the Grid system and certain facilities required at the Authority's power stations, and with the standardisation of terms and conditions for wayleaves. The duties of the Grade 8 post also comprise administrative work in the wayleave section, related in particular to the statutory consents and Departmental and local planning clearances required for Grid lines.

Candidates for either post should be familiar with the relevant legislation and with the negotiation and correspondence which such work entails. For the Grade 9 post, however, specialised knowledge and experience of this kind are less important than administrative ability and, in particular, the ability to prepare clear written statements based upon technical and administrative considerations.

Applications stating age, qualifications, experience, present position and salary to D. Moffat, Director of Establishments, British Electricity Authority, Winsley St, London, W.1, by 19 Feb., 1955. Quote ref. AE/567. (P 650)

CABLE JOINTERS required for permanent situations in South Africa based on Johannesburg. Candidates should be experienced on all types of Cable including Pressure Types. Send full details to—Box No. 4233, Electrical Times. (P 679)

CONTRACTS ENGINEER required to handle cable installation contracts of all types up to 66 kV. Candidates should have a sound technical background and adequate practical experience. This appointment is for a permanent situation in South Africa based upon Cape Town but the candidate is expected to be available for service in any part of the Union and the Rhodesias. The salary offered will be commensurate with responsibilities. Write giving full particulars in first instance to—Box No. 4231, Electrical Times. (P 678)

CABLE ESTIMATOR required preferably with knowledge of mains cable and bare copper. Write: Edison Swan Electric Co., Cable Department, 155 Charing Cross Rd, W.C.2. (P 641)

DESIGN ENGINEER required for the development of outdoor-type high voltage isolating switches and fuse gear for 11 kV and above. Applicants must have had good Drawing Office training and experience in the design of similar equipment. Write, giving full particulars of experience, age and salary required to—Box No. 4205, Electrical Times. (P 557)

DESIGNER DRAUGHTSMAN required, this is an opportunity for a man with imagination, initiative and drive who is capable of carrying a project through all stages with the minimum of supervision. Successful applicant will be engaged on the design and development of electro-mechanical devices. Preference will be given to men who have held similar positions and who have a sound knowledge of the technique required in mass production.

Salary will depend entirely on the suitability of the man engaged—salary ceiling being a secondary consideration—and we are open to consider all really first class men, first and foremost on their capabilities for the vacancy. Company situated 20 miles north of London, 5-day week. Holidays this year by arrangement. Our staff are aware of this advertisement.

Interviews will be between 10.30 and 4.30 Monday to Friday, but by special request evenings or Saturdays, travelling expenses will be paid. Write stating age, previous experience, salary required and time of interview if special.—Box No. 4241, Electrical Times. (P 683)

DRAUGHTSMAN required by large company for work abroad. Applicant must be capable of preparing layout and foundation drawings of substations, making enlarged street plans and detailed drawings showing cable locations. Must also be capable of carrying out site measurements of cables, recording of street crossings, joint box positions, etc. Single man preferred. State age, experience and salary to—Box No. 4217, Electrical Times. (P 620)

ELECTRICAL BUYER (aged 28/40) required by important Company in London connected with the Oil Industry. Minimum technical qualifications—Higher National Certificate in Electrical Engineering. Preference will be given to applicants who have served a recognised apprenticeship with electrical manufacturers or in the supply industry and who have had previous sales or buying experience. Duties will involve procurement of all types of electrical equipment ranging from major plant to domestic installations. Salary according to experience. Please write, quoting Ref. No. 45/M, to Box E.T. 810, c/o 191 Gresham House, E.C.2. (P 625)

ELECTRICAL ENGINEER, age 25 to 30, Graduate essential, preferably from full-time University Course with some experience of light current supervisory equipment required at our Weybridge Office for detailed engineering and contract work on E.H.T. transmission equipment and supervisory control. Apply Kennedy and Donkin (ref.: MVR), 12 Caxton St, London, S.W.1. (P 646)

ELECTRICAL FITTER required. Applicants should have outside erection experience on H.V. switchgear and transformers. Wages at present 4s. 1d. per hour. N.J.I.C. Conditions. Apply, in writing, to Mr H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, 31 Kingsway, Stoke-on-Trent. (P 675)

ENGINEERS wanted by large firm of Power Cable Installation Contractors, preferably with some practical experience of outside Contract work (age group 25/45). Pension Fund and good Staff conditions. Apply in writing, quoting reference C/71/55 to—Box No. 4237, Electrical Times. (P 681)

ELECTRICAL ENGINEER required for the Electrical Department of a large Industrial undertaking in the London area. Applicants should hold an Engineering Degree or be a Member of the Institute of Electrical Engineers and should have a knowledge of the design, operating and testing of Electrical Installations in factories including H.T. and L.T. Switchgear.

Apply giving full details of age, qualifications, experience and salary to—Box No. 4245, Electrical Times. (P 694)

ENFIELD CABLES LIMITED have a vacancy in their CONTRACTS SALES DEPARTMENT in London. Applicants should have experience of tendering for cable installation work in this country, and experience of handling Export enquiries of similar nature will be an advantage. Applications should be addressed to Manager, London Sales Office, Enfield Cables Limited, Victoria House, Southampton Row, London, W.C.1. (P 651)

FOREMEN with experience of Power Cable Installation (voltages up to 132 kV) required for Contract work in the United Kingdom and also abroad. (Age group 35/50.) Apply in writing, quoting reference C/72/55 to—Box No. 4239, Electrical Times. (P 682)

HEATING ENGINEER required for Technical Sales duties in the London Area by well-known firm of manufacturers specialising in electrical space heating. Applicants should be A.M.I.H. AND V.E. and have good electrical knowledge. Aged 26/35 years; Superannuation Scheme. Salary £750/£850 according to qualifications and experience. Write giving full particulars to —Box No. 4227, Electrical Times. (P 653)

HIGH-CLASS electrical accessory manufacturer requires REPRESENTATIVE to cover London and South Eastern Counties of England. Calling on Architects, contractors, electrical authorities and wholesalers. Salary and commission and expenses paid. Pension Scheme operative.—Box No. 4207, Electrical Times. (P 558)

JOINTER required. Wages at present 3s. 11d. per hour. N.J.I.C. Conditions. Apply in writing to District Manager, Midlands Electricity Board, 31 High St, Stourbridge. (P 674)

JUNIOR ELECTRICAL ENGINEER, age between 25 and 30, having served a recognised apprenticeship with a well-known manufacturer of Diesel Engine-driven Generators, urgently required. Applicants should have general knowledge of A.C. and D.C. generating plant and switchgear, be capable of specifying requirements and conducting correspondence for the purchase of such electrical equipment. Applications stating age, qualifications and experience to Employment Manager, Ruston and Hornsby Ltd., Lincoln. (P 692)

JUNIOR ASSISTANT ELECTRICAL ENGINEER for large process factory in Dublin, age 24-32 years with apprenticeship and training in works of repute, and having a sound knowledge of general mechanical and electrical plant. Applicant should be University graduate or corporate member of I.E.E., and should have considerable experience of maintenance and operation of H.T. Substations, rectifiers and factory electrical equipment.

Successful candidate must pass a medical examination. Non-contributory pension scheme. Assistance in moving home. Commencing salary in range £800 to £1,100 according to experience.

Give full particulars of age, training, experience and present position, to—Box No. 4213, Electrical Times. (P 611)

LONDON export department of switchgear control gear manufacturers require SALES ENGINEER to deal with estimates, tenders, overseas correspondence; interesting and progressive position write—Box No. 4229, Electrical Times. (P 654)

LEADING OIL COMPANY requires one ELECTRICAL ENGINEERING DRAUGHTSMAN for work in London. Age 25 to 30 years. Candidate should possess the Ordinary National Certificate in Electrical Engineering or have equivalent qualification. Good practical experience required followed by 3 to 5 years in the drawing office on electrical installations for Process Plants, Workshops and Factories. He will have opportunities of visiting refineries for periods of temporary duty. Opportunities for promotion to engineering appointments occur within the Company and with its Associates both in the U.K. and overseas. Write giving full details and quoting H.3261 to Box 7287, c/o 191 Gresham House, E.C.2. (P 693)

METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED, Trafford Park, Manchester 17, have vacancies in the Research Department for TECHNICAL ASSISTANTS for development work on electrical INSULATING MATERIALS and VARNISHES. Applicants should not be over age 27 and should have technical knowledge or experience of electrical engineering. Apply to the Personnel Manager, marking envelope "W." (P 652)

OVERHEAD LINE ENGINEERS required by Consulting Engineers for supervision of power transmission and distribution schemes in North Scotland. Applicants should have had experience in the design and construction of wood pole lines up to 33 kV. Salary according to experience. Applications, together with details of education, training and experience, should be sent to Messrs Kennedy and Donkin, 3 North Charlotte St, Edinburgh, 2. (P 642)

PIRELLI-GENERAL CABLE WORKS Ltd. have SALES DEPARTMENT STAFF VACANCIES for General correspondence and preparation of Mains Cable Tenders. Apply in writing to Sales Manager, Leigh Rd, Eastleigh, Hants. (P 552)

REPRESENTATIVE required by industrial electrical and mechanical repair specialists, for the London district. Applications in confidence to London Sales Manager, Dowding and Mills Limited, 26 White Post Lane, London, E.9. (P 637)

SALES ENGINEER required for London and Southern Counties by progressive company manufacturing Switchgear and Distribution equipment. Applicants should preferably have had experience in the manufacture, installation and operation of distribution equipment for MV and HV systems. Write, giving full particulars of experience, age and salary required to—Box No. 4219, Electrical Times. (P 627)

SALES ENGINEERS, automatic control gear and switch fuse gear, required operating in the Lancashire, Yorkshire, and Birmingham areas. Must have confidence in own ability and capacity for hard and sustained work. Outside sales experience essential. Salary commensurate with qualifications and experience. Apply in writing only to the Sales Manager, The Donovan Electrical Co., Ltd., Granville St, Birmingham. (P 687)

SALES REPRESENTATIVE N.E. COAST, domiciled Newcastle-on-Tyne area, required by electrical manufacturers. Wiring accessories and L.T. distribution equipment. With electrical training and experience, preferably of installation practice. Sales experience. Driving and correspondence. Medical examination. Salary, commission, contributory pension, expenses, car. Informative letter with recent photo, confidentially to—Box No. 4203, Electrical Times. (P 556)

SENIOR ELECTRICAL DRAUGHTSMAN required with experience in Power Station Layout work. Good salary to suitable applicant. Pensionable position. Apply giving full experience to Personnel Manager, Costain-John Brown Ltd., 73 South Audley St, W.1. (P 657)

SKILLED ELECTRICIANS required for maintenance of large motors, starters, automatic contactor gear and distribution switchgear in large paper mills in North Kent. Must be experienced in fault finding and able to read drawings and wiring diagrams. Permanent employment for the right men. Pension scheme, canteen facilities and sports club. Apply stating age, training and experience, to—Box No. 4247, Electrical Times. (P 695)

SURVEYOR required for Overhead Line Pole Routes, Inverness Area. Good salary plus subsistence to right man. Apply —Box No. 4235, Electrical Times. (P 680)

TECHNICAL ASSISTANT required for London. Work involves Overhead Transmission and Distribution Line Design, and experience is preferable but not essential. Applicants should possess qualifications to H.N.C. standard. Pension Fund. Staff Canteen. 5-day week. Salary according to qualifications and experience. Apply in writing to Staff Officer, B.I.C.C.C. Ltd., 30 Leicester Sq, London, W.C.2, quoting Ref. C/75/55. (P 691)

TECHNICAL ASSISTANT required for their London Head Office by a leading Electric Cooker Manufacturer for an interesting and progressive position.

Minimum qualifications: INTER B.SC. Engineering and/or Graduate Membership of the I.E.E., with some training as a Mechanical Engineer.

Salary according to qualifications, age and experience. Please reply giving full details of career to date, and present salary to—Box No. 4734, c/o 117 Piccadilly, London, W.1. (P 550)

THE ENGLISH ELECTRIC CO., LTD., Stafford, require an ASSISTANT DESIGN ENGINEER in the Electrical Rotating Machine Design Department, preferably with some experience in the design of large D.C. machines. Reply stating age, experience and qualifications to Dept. C.P.S., 336/7 Strand, W.C.2, and quoting ref. No. 74E. (P 584)

THE ENGLISH ELECTRIC CO., LTD., at Stafford, has interesting internal vacancies for ENGINEERS to assist with commercial aspects of contracts for comprehensive hydro-electric schemes. Applications are invited from those having experience of this type of work and also from young engineering graduates or H.N.C. holders having just completed an apprenticeship and who wish to pursue a commercial career in industry. Please apply to Dept. C.P.S., 336/7 Strand, W.C.2, quoting ref. No. 756E. (P 583)

TRANSFORMER ENGINEER required with considerable experience in the design of Power Transformers up to 66 kV. Applicant should have initiative, will be required to take charge of small design office and should be conversant with modern practice. The position is permanent and progressive. Pension Scheme available. Situation West of London. Apply in confidence to—Box No. 4181, Electrical Times. (P 478)

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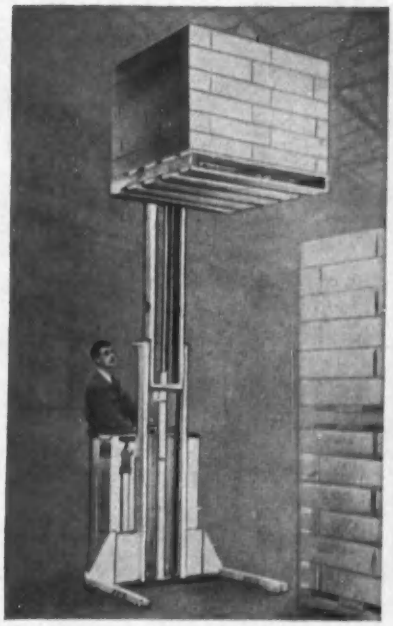

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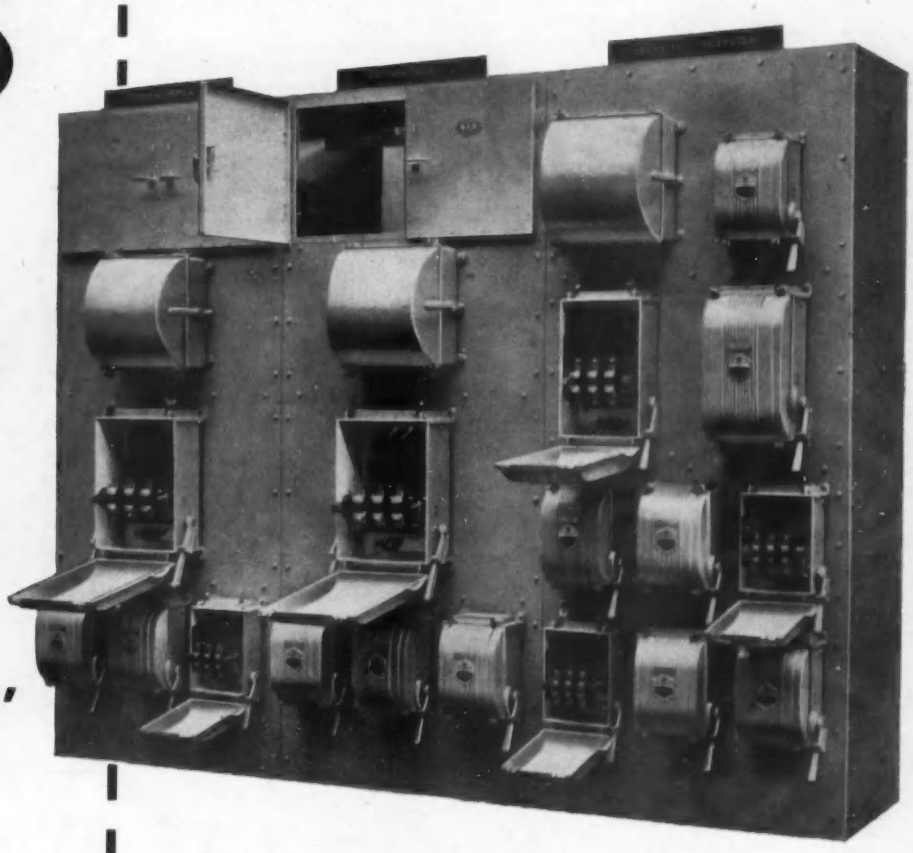

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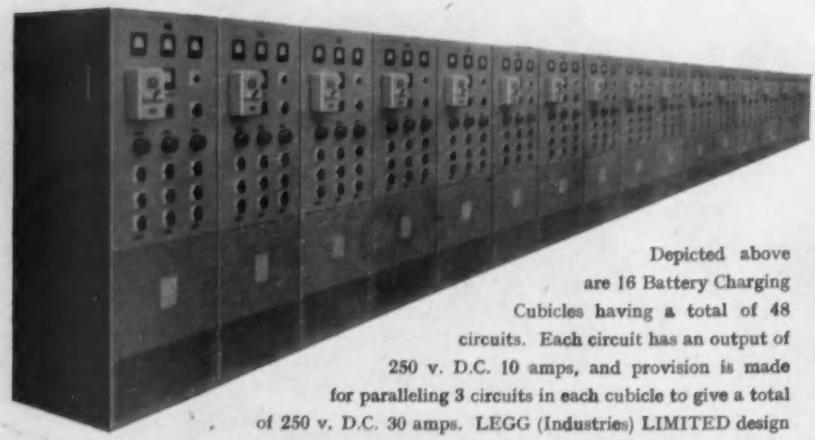

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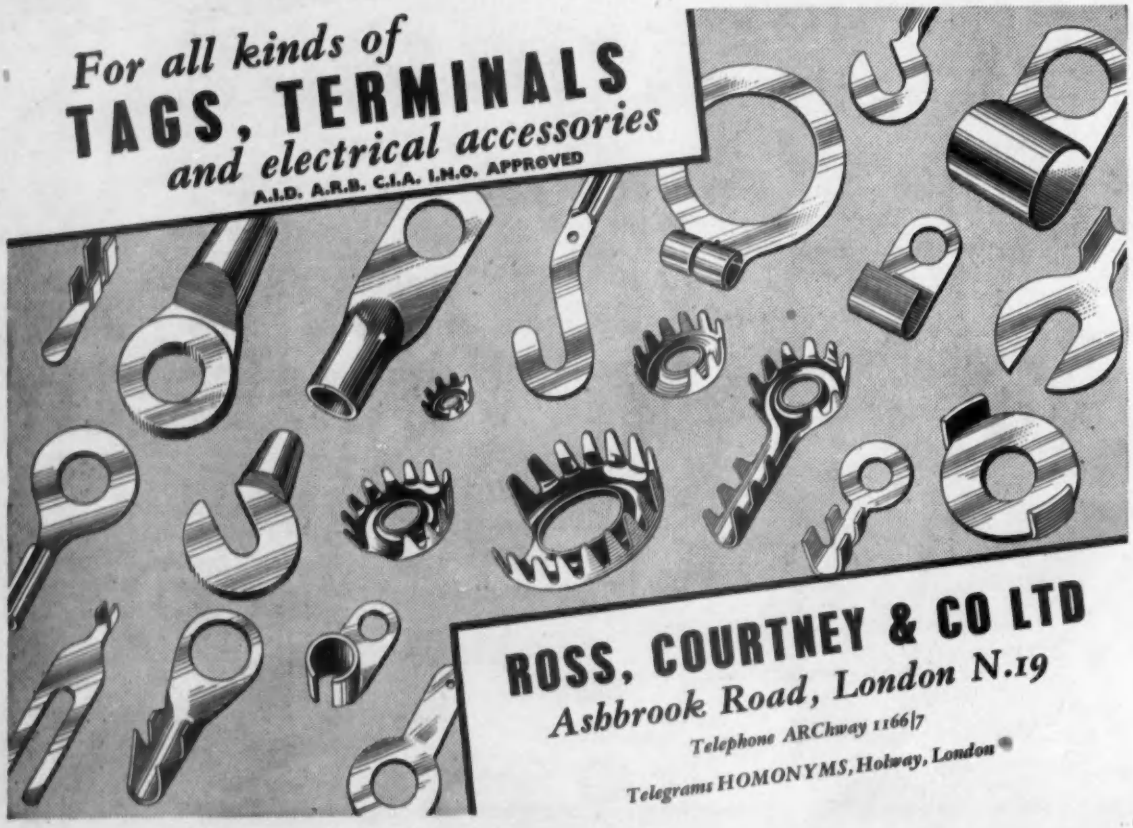

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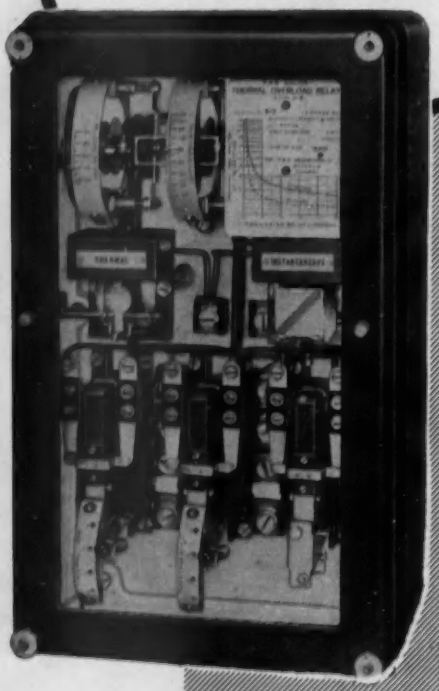

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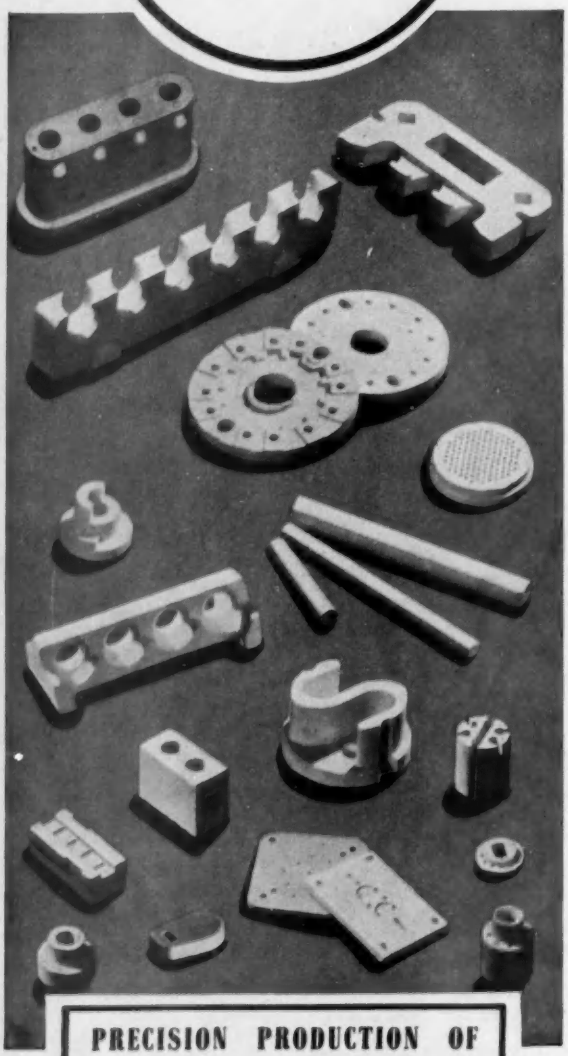

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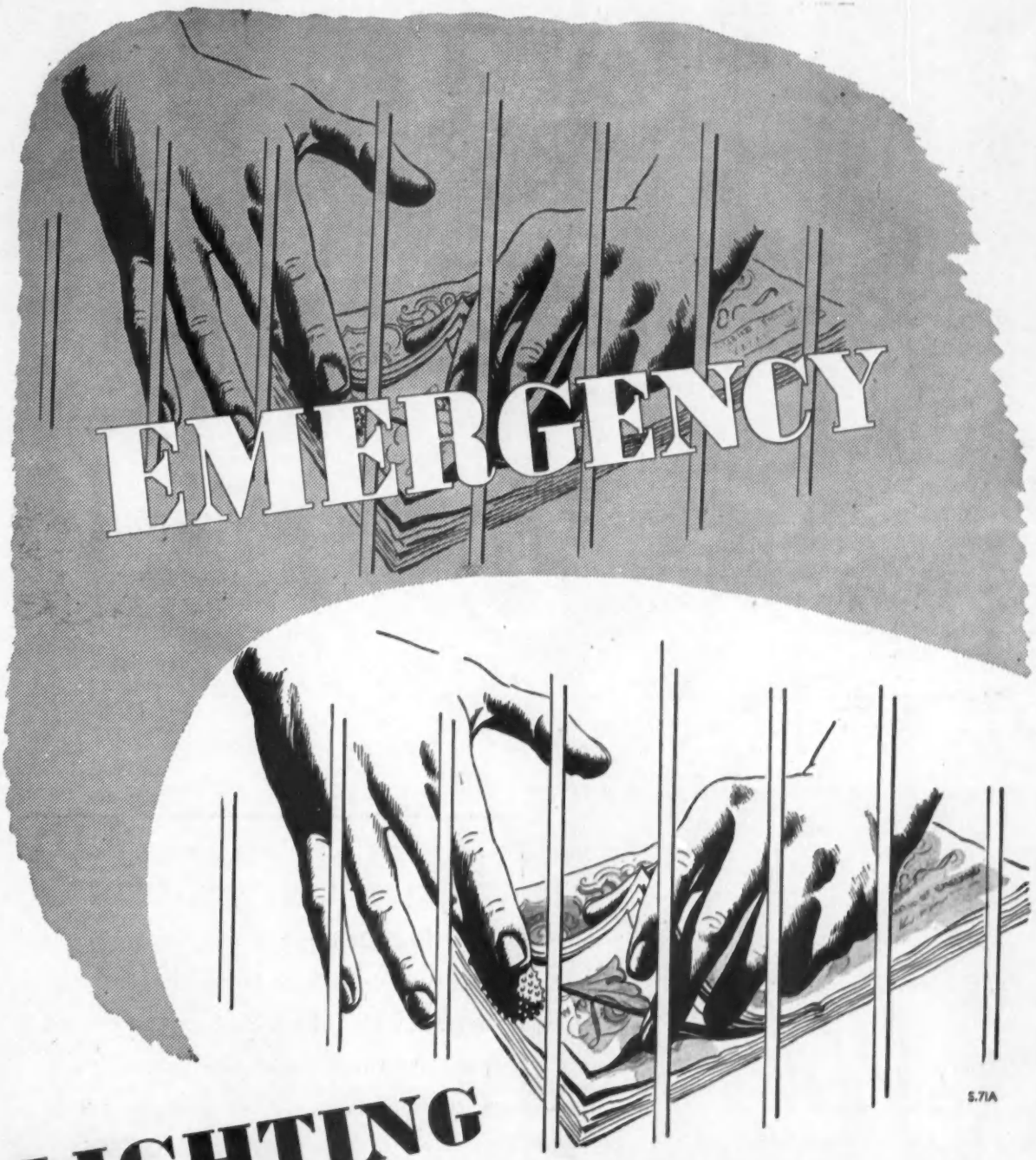

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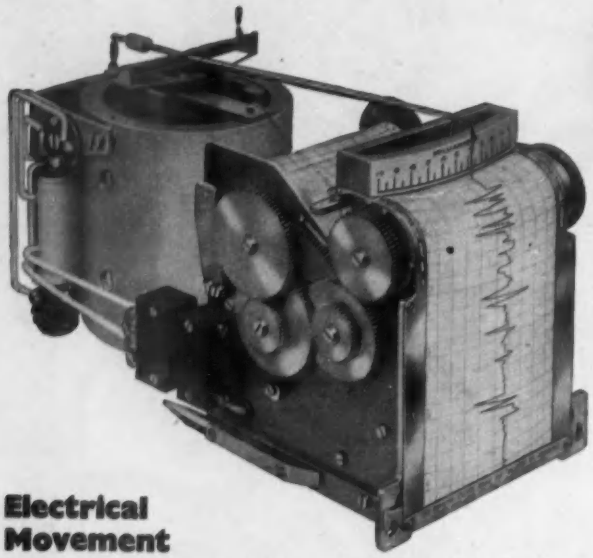

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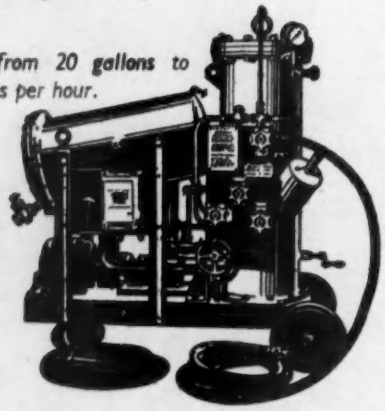

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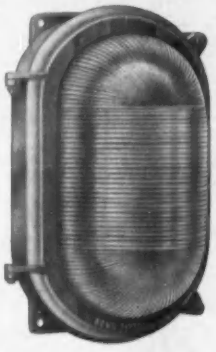

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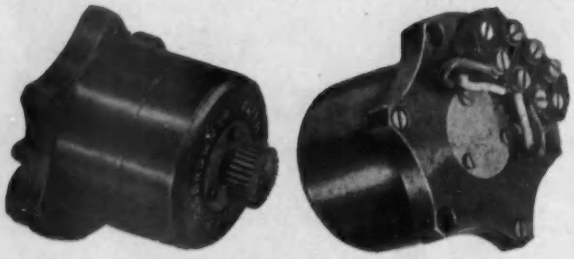

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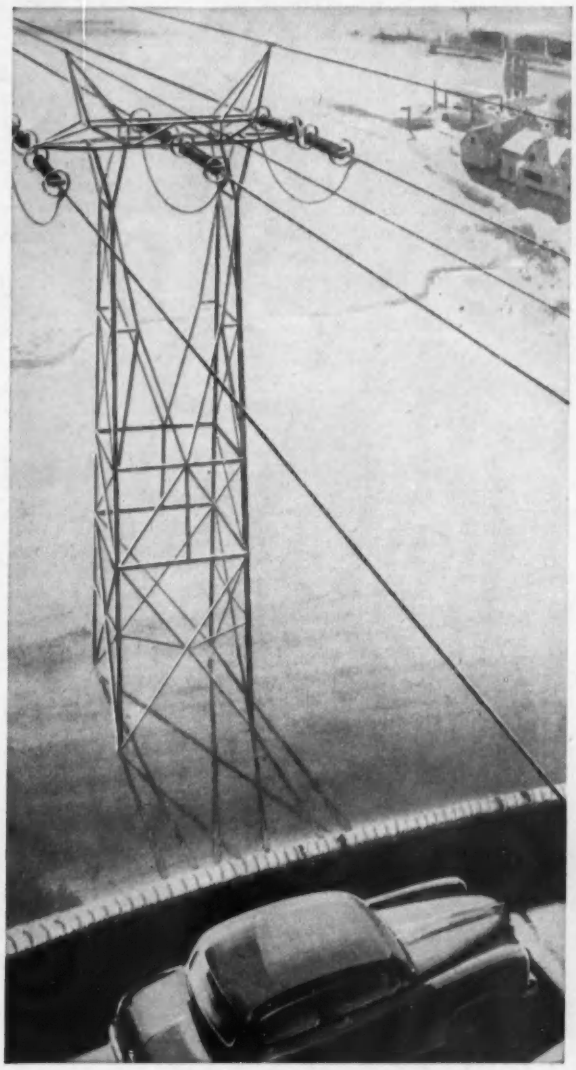

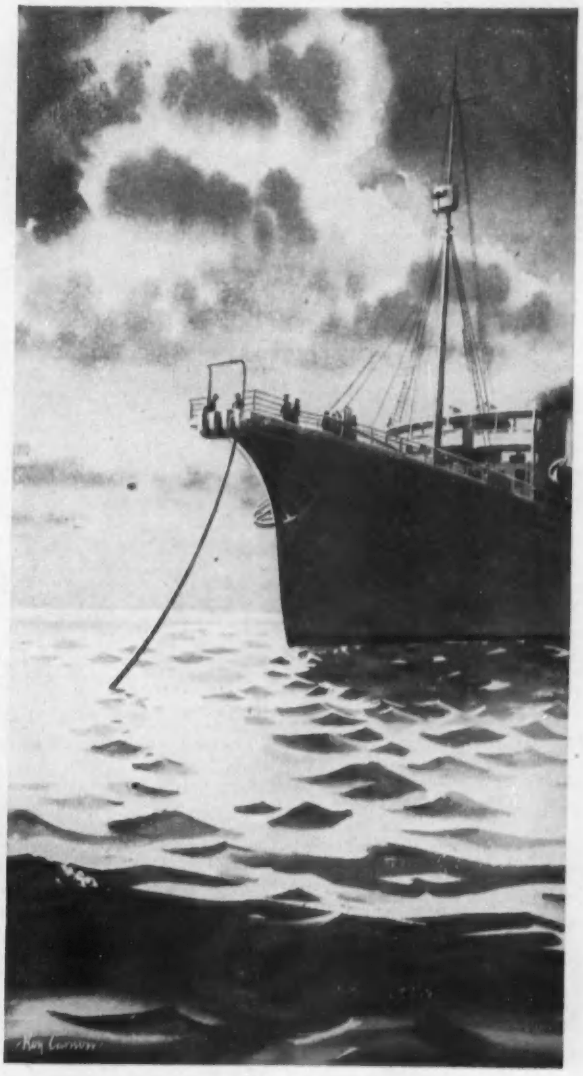

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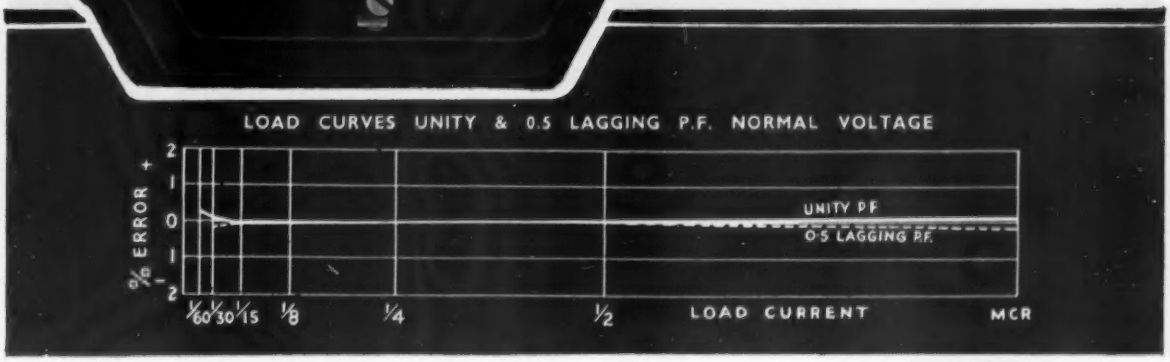

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